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JUL 14 1960
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The Electrical Industry's Weekly Magazine July 11, 1960

Electrical World

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THE UNIVERSITY OF MICHIGAN
JUL 14 1960
BUSINESS

Underground 34.5 Kv Will Serve Airport Load of 26,750 Kva.. p 60

Braymer Reports on World Power Conference-p

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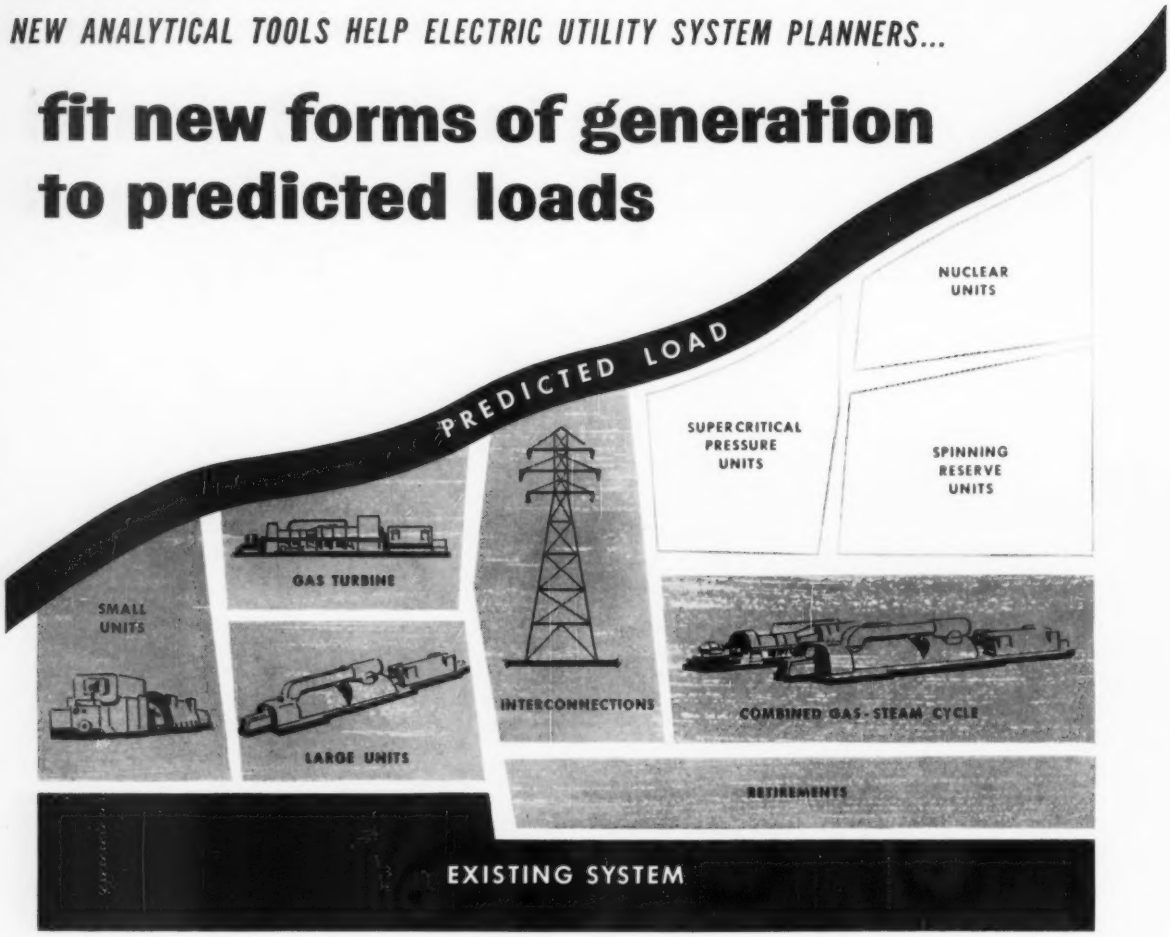
NEW ANALYTICAL TOOLS HELP ELECTRIC UTILITY SYSTEM PLANNERS...

fit new forms of generation to predicted loads



POWERFUL NEW MATHEMATICAL TECHNIQUES to analyze the type, size, location, and timing of new power generation facilities have recently been developed by General Electric engineers, working co-operatively with system planning engineers of several electric utilities. These techniques simulate, with a high degree of accuracy, the performance of future systems.

NEW FORMS OF POWER GENERATION, many of them developed by General Electric, now offer electric utilities further cost-saving possibilities. At the same time, vastly different capital-cost and fuel-cost characteristics of new units create a problem of choice. System planners who seek optimum generation expansion patterns are confronted by alternatives more numerous and more complex than ever before.

TO DEVELOP SIMPLIFYING PROCESSES that can counteract processes of complication, electric utility system planners, together with leading electrical manufacturers, have been working to develop more effective analytical tools.

General Electric's new technique, using high-speed digital computers, is the most comprehensive method now available for arriving at accurate cost models of future power generation patterns:

- Units are scheduled on an equal incremental cost basis.
- The computer model accurately represents hourly load variations throughout the period under study.
- Daily load cycles being simulated are continuously modified to accord with days of the week, seasons of the year, and long-term growth trends.
- Units are started and stopped to meet spinning reserve requirements.
- Maintenance is done on the constant-risk principle.

CO-OPERATIVE PLANNING SUPPORT is available to your company. Contact your nearest General Electric Apparatus Sales Office for more information. For a copy of GER-1680, "Computers Aid System Generation Planning," write to the General Electric Company, Section 604-03, Schenectady 5, N. Y.

GENERAL ELECTRIC

Electrical World

Vol. 154, No. 2 JULY 11, 1960

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electrical power

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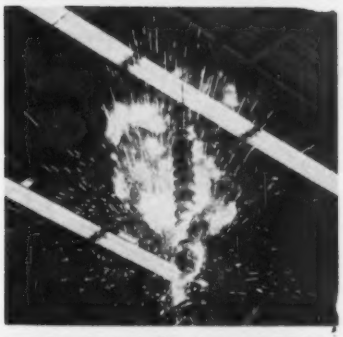

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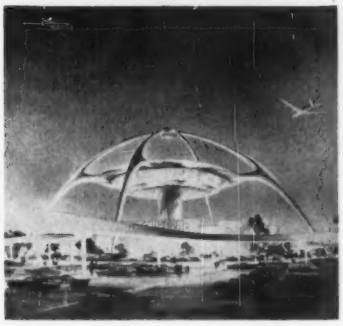

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The PM-20 is available in three standard sizes to handle 40', 55' and 70' poles. An optional hydraulic or manually operated head sheave extends 56" to increase the reach to 25½', 29' and 34' for hoisting 50', 65' and 80' poles.

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ELECTRICAL WORLD

Vol. 154, No. 2, July 11, 1960

Published weekly by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948), Founder. **Executive, Editorial, Circulation and Advertising Offices:** McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 90-129 North Broadway, Albany 1, N. Y. See panel below for information regarding subscriptions or change of address.

Officers of the Publications Division: Nelson L. Bond, President; Shelton Fisher, Wallace E. Truendly, Senior Vice Presidents; John R. Callaham, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator. **Officers of the Corporation:** Donald C. McGraw, President; Joseph A. Gerardi, Hugh J. Kelly, Harry L. Waddell, Executive Vice Presidents; L. Keith Goodrich, Vice President and Treasurer; John J. Cooke, Secretary.

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United States and Canada subscription rate for individuals in the field of the publication $6.00 per year; single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

Second-class postage paid at Albany, N. Y. Title registered in U. S. Patent Office.

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SUBSCRIPTION AND ADDRESS CHANGES: Send subscription correspondence and change of address to Fulfillment Manager, ELECTRICAL WORLD, 330 West 42nd Street, New York 36, N. Y. Subscribers should notify Fulfillment Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

Postmaster . . . Please send form 3579 to Electrical World, 330 W. 42nd St., New York 36, N. Y.

LETTERS

Invention Gains Attention

To the Editor:

Thank you indeed for the list of readers who requested more information on the "Air Dart." You have been very helpful to us with encouragement to make this "Air Dart" available commercially.

We have made arrangements with Pioneer Electric of Winnipeg, Canada, to manufacture and distribute this apparatus. . . .

Thank you again for your help.

S. J. Hampton
Chief Electrical Engineer
Electric Light & Power Distribution System
City of Edmonton
Alberta, Canada

▶ *Good luck to Reader Hampton in this new venture. He and his colleague, N. J. Christophers, described his "Air Dart" device in the April 25 issue of Electrical World (p 118) as a method for propelling small nylon lead ropes through ducts. It consists of the dart to which the rope is tied, a nylon rope reel, and a duct plug with openings for the rope and an air or gas opening. The air or gas under pressure is used to propell the dart through the duct. A number of our readers wrote us for additional information.*

Nothing New Under Sun

To the Editor:

We are interested in the condenser photo story on page 70 of the June 13 issue of Electrical World. This, more or less, proves the old adage that "there is nothing new under the sun."

The idea of constructing condensers on a so-called "modular" type of construction has been used by Foster Wheeler (and others) for many years.

Our condenser engineers advise that this same condenser would have been designed by Foster Wheeler to consist of two shell sections, a condenser neck, hot well, and water boxes.

Photographic evidence is attached of such design. This was done as far back as 1955.

J. M. West, Manager
Sales Promotion Dept
Foster Wheeler Corp
New York 19, N. Y.

▶ *Thank you, Reader West, for keeping us on our toes.*

This is your column in Electrical World. We welcome your comments, questions, criticism. Please address correspondence to Letters Editor, Electrical World, 330 W 42nd St, New York 36, N. Y.

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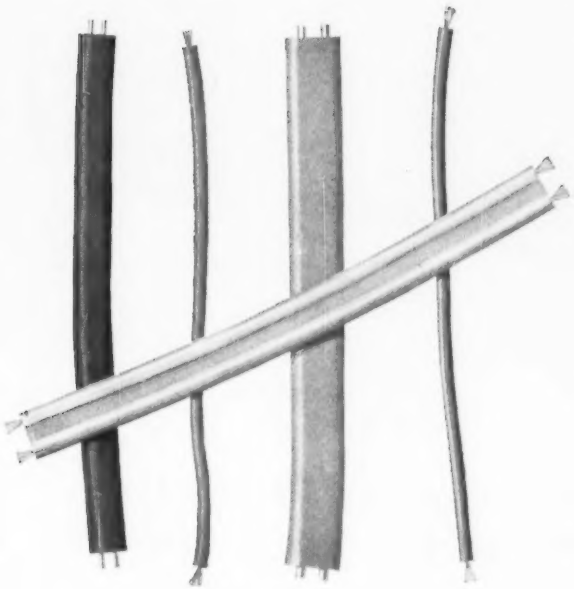

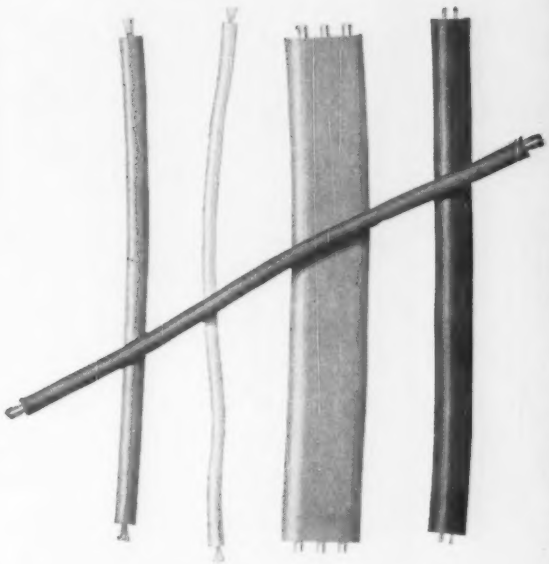

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IPCEA Appendix I.

ASTM D-734.

MIL-W-76A, Types LW, MW, and HW.

U.L. 80°C. appliance wire.

***JACKET**

ASTM D-1047 (Passes -40° C. cold bend).

UF-NMC.

REA Spec. PE-14.

IPCEA, Appendix J.

IMSA, Spec. 19 and 20.

Inside-outside telephone cable (Staple Gun Wire).

Jan-C-17A Type I.

MIL-C-15479A (Harbor Defense).

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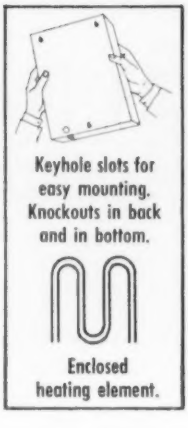

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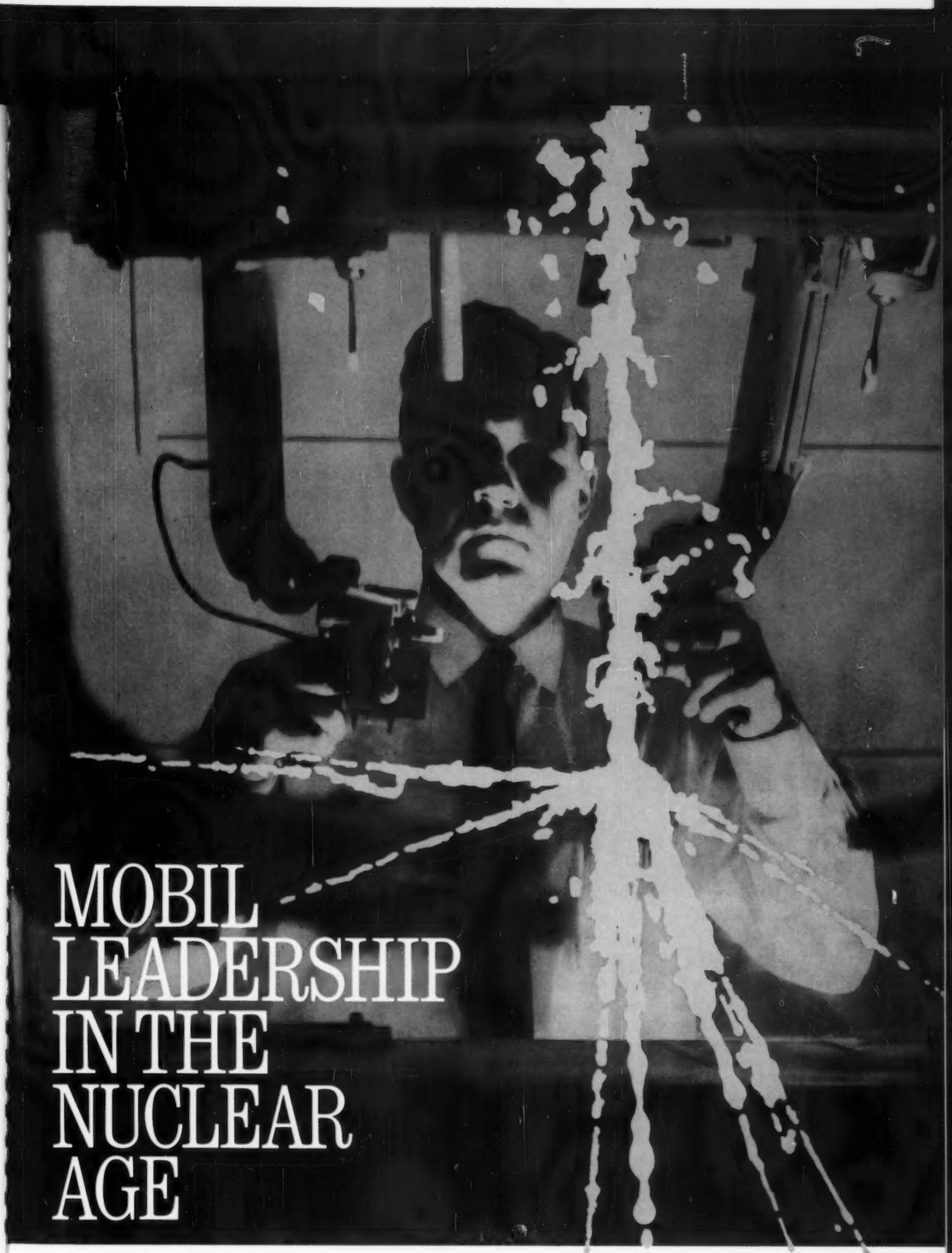
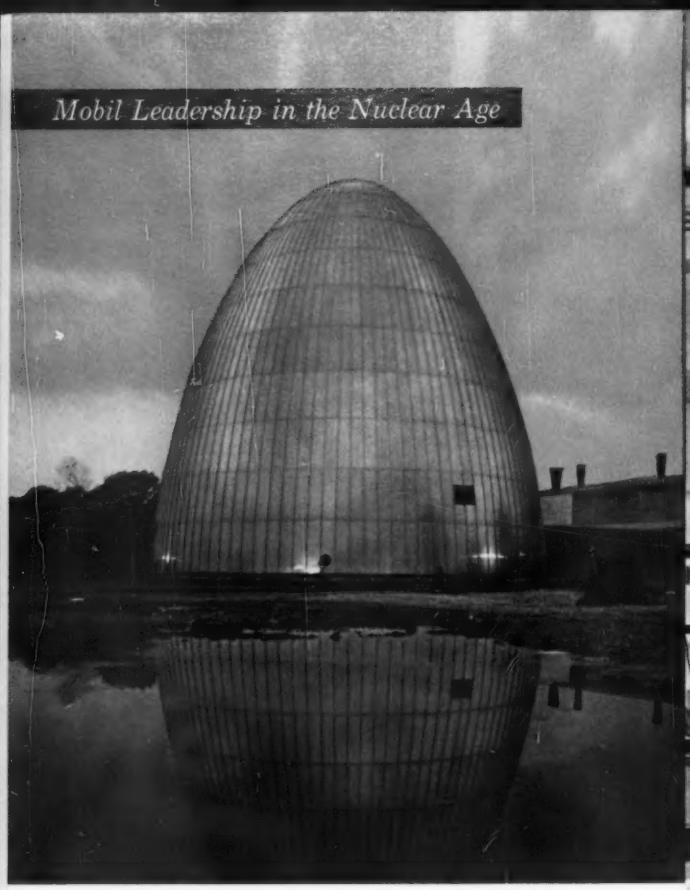


MOBIL LEADERSHIP IN THE NUCLEAR AGE

On the following pages, a report on Mobil's many activities in the field of Nuclear Radiation Research and what is being accomplished. How Mobil is meeting the challenge and problems posed by Nuclear Age Lubrication ... from America's leading protector of Nuclear-Powered Turbines. Mobil

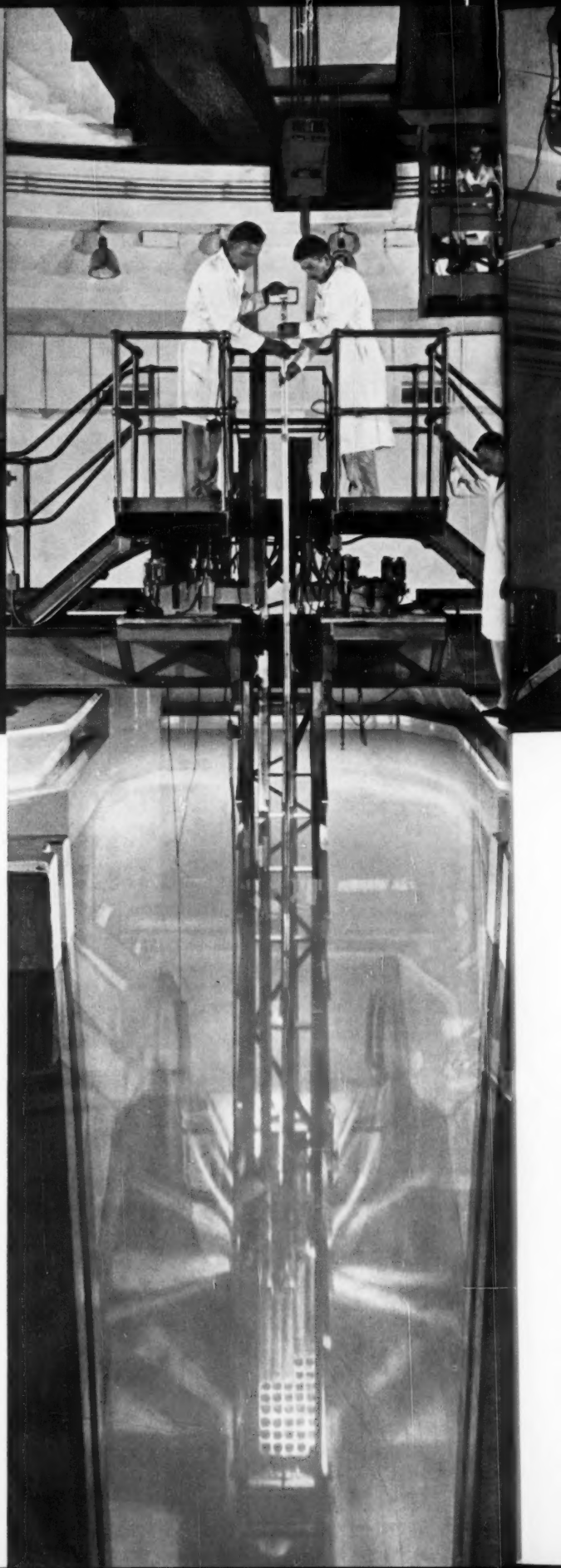
Mobil Leadership in the Nuclear Age



This unique dome-shaped structure houses the Industrial Reactor Laboratories Inc., where Mobil participates with companies from other areas of industry in nuclear research activities.

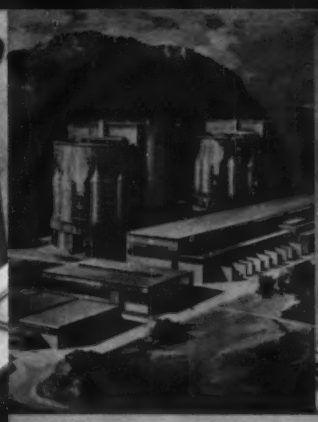
Mobil Nuclear Research

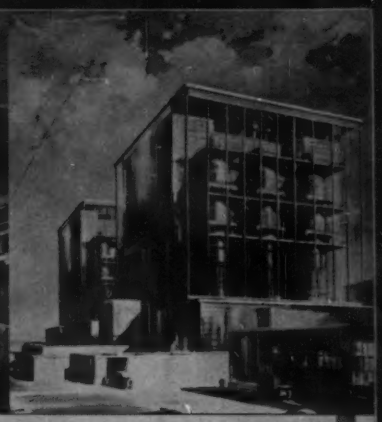
As a world leader in petroleum technology, Mobil is meeting the challenge of the Nuclear Age with facilities, programs and products. No one yet has all the answers. But Mobil Nuclear Research is opening many doors to future progress. For example, Mobil is part owner of one of the world's most advanced private nuclear research facilities, Industrial Reactor Laboratories in Plainsboro, N. J. Here a 5-million watt nuclear reactor is used to explore new refining techniques, the manufacture of petroleum chemicals, and effects of radiation on petroleum products. Mobil's own nuclear laboratory near Princeton, N. J. includes a 2-million electron volt particle accelerator and other advanced equipment to probe the atomic frontier. This research is yielding new knowledge, products and processes . . . and improved lubrication for Nuclear-Powered equipment.

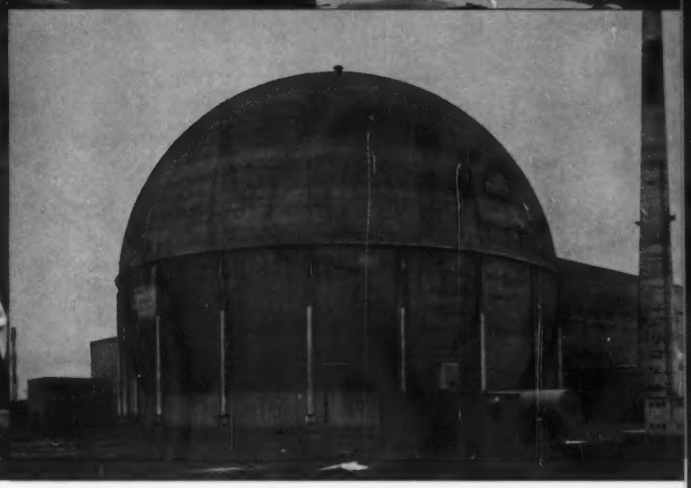


View of 5-million watt swimming-pool-type reactor used by Mobil at IRL. Primary purpose is to provide source of neutron and gamma rays for experimentations. Mobil scientists use this radiation source to develop new petroleum products and chemicals.

2-million electron volt Van de Graaff accelerator at Mobil's Stony Brook Nuclear Laboratory is used to irradiate test specimens . . . help Mobil study effects of radiation on petroleum materials and find improved refining techniques.







Top-left: 360,000-kw Station being built at Hunterston, England. *Right:* 561,000-kw Atomic Power Station under construction at Hinkley Pt., England. *Below:* Dresden Nuclear Power Station in Illinois, now America's largest. All rely on Mobil.

Mobil Nuclear Lubrication

Through research, Mobil has determined the radiation limits of its present power plant lubricants, and is developing high threshold products for use where radiation exceeds these limits. These evaluations show Mobil DTE oils meet every requirement of today's Nuclear-Powered turbines. And certain Mobil extreme-pressure greases can withstand 200-million rads. In addition to these present-day lubricants Mobil has developed experimental products that resist doses of up to a billion rads, including a control-rod actuator grease approved by the United Kingdom Atomic Energy Authority. Mobil is also evaluating a method of determining condition of oil in use by adding a radiation-sensitive tracer that accurately shows when radiation limits are reached. These are some of the ways Mobil is preparing today for tomorrow's nuclear power needs.

Mobil Protected Nuclear Power Plants

For years Mobil has been a world leader in the lubrication of conventionally powered turbines. Now in the Nuclear Age Mobil leadership continues. By early 1961 more than 60% of America's nuclear power output will be generated with the help of Mobil lubricants. America's largest atomic plant—the 180,000-kw Dresden Nuclear Power Station—protects its turbine with Mobil DTE oil. And even larger plants abroad will be Mobil protected. The 360,000-kw Hunterston plant and the 561,000-kw Hinkley Pt. plant under construction in England will both rely on Mobil. Mobil research and know-how are behind Mobil's continuing leadership in the Nuclear Age.

Hinkley Pt. Power Station—Built by English Electric Co., Ltd., Babcock and Wilcox Ltd., Taylor Woodrow Atomic Power Group for Central Electric Generating Board. **Hunterston Nuclear Power Station:** Builders—General Electric Company Limited of England for the South of Scotland Electricity Board. **Dresden Nuclear Power Station**—Built by General Electric Company for Commonwealth Edison Company and the Nuclear Power Group.

America's leading protector of Nuclear-Powered Turbines!

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Mobil

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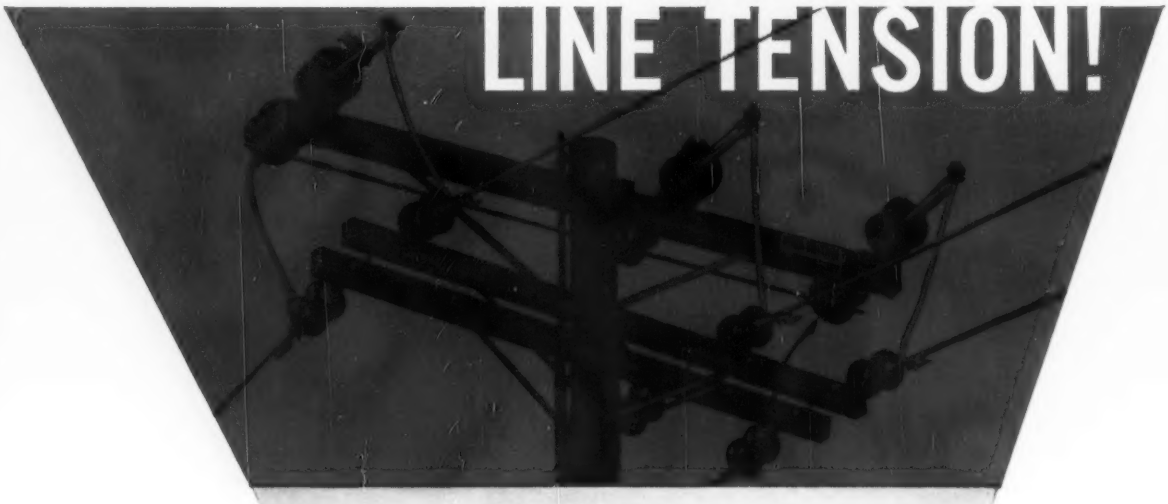

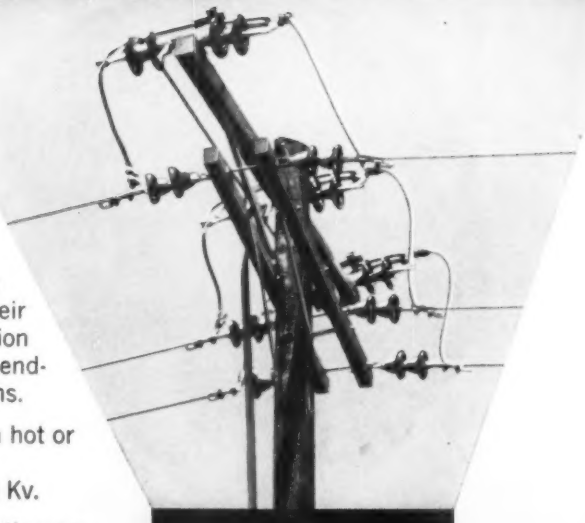

KPF air break switches operate equally well with or without conductor tension—tension is not necessary to their smooth functioning. Thus KPF switches may be installed on angle poles, major crossings or other locations where separate deadends are desired. Further, their simple design eliminates lubrication or maintenance, and insures dependability under all weather conditions.

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The Electrical Week

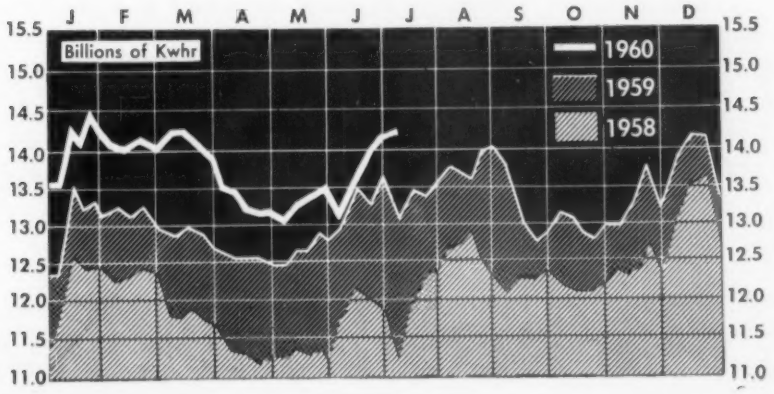
LATE NEWS ▶ **Washington Wire** . . . REA tightens down on borrowers reinvesting surplus funds; offers 2% US Treasury bonds for sale after loan repayment, capital improvements and advance loan repayment . . . FPC starts investigation to find whether non-federal operators of downstream dams on Connecticut River owe upstream owners for benefits . . . Contract with PG&E is credited with giving USBR 450,000 kw of firm power to sell from the Central Valley Project, Calif., instead of 190,000 kw by Interior Secretary Fred Seaton. New allocations to preference customers are made . . . Nez Perce gets rabbit punch from Senate Commerce Committee as it approves bill to prevent dams across Salmon River until fish passage is assured . . . Arkansas Valley G&T Co-op will build generating station to be operated by Southern Colorado Power; sell present unit to SCP.

Around the States . . . Democratic Platform Committee, expected to recommend pro-public power plank, greets Clyde T. Ellis warmly and schedules no private power witnesses . . . Florida PUC approves petition by five state utilities for random sample watthour meter testing . . . 1961 Live Better Electrically advertising will sharpen competitive approach, push case for electricity as public service.

Items Abroad . . . First technical conference between TVA, Ontario Hydro, and British Central Electricity Generating Board (combined generation 44 thousand Mw) also covers problems of finance management, and purchasing. Next conference will be held on TVA system in 1962 . . . India and USSR reach agreement for turbogenerator and boiler for first block of Neiveli Power project in state of Madras. Lignite-burning plant will ultimately be 300 Mw . . . First Australian 100-Mw unit at Tallawarra Power Station, starts operation in August. Second 100 Mw unit will start operation next year.

From the Manufacturers . . . GE announces 6.4% increase in price of 50-kvar capacitors, effective July 1. New price is $99 per unit.

WEEKLY POWER OUTPUT—UP 8.6% (Week ending July 2), Kwhr 14,247,000,000



Per Cent Change From Previous Year

	June 18	June 25	July 2
Total U. S.	+ 5.4	+ 3.4	+ 8.6
New Eng.	+ 3.8	+ 4.3	+15.1
Mid. Atlan.	+10.3	+ 3.4	+10.8
Cent. Ind.	+ 1.8	— 1.7	+ 3.7
West Cent.	— 0.7	— 1.6	+10.5
Southeast	+ 5.3	+ 4.3	+ 8.4
South Cent.	+ 5.2	+10.7	+ 8.2
Rocky Mount.	+ 5.4	+ 6.3	+14.9
Pacific			
NW	+10.8	+ 7.8	+ 9.4
SW	+ 9.9	+ 6.5	+11.3

Seasonally Adjusted Index 267.2

Week Ago 267.4 Year Ago 258.6

Source: Edison Electric Institute

Preview of This Issue

EVENTS ▶ **Castro government threatens Cuban Electric Co,** a subsidiary of American & Foreign Power Co, as move to nationalization of all US-owned industries gathers momentum (p 52) . . . Ed Vennard argues for investor-owned utilities as educational energy institute lapses into private-public power debate at American University in Washington, D. C. (p 54) . . . Cleveland Electric Illuminating crews work around the clock after explosion in downtown underground distribution system (p 53) . . . New indictments name some private utilities who were customers of electrical manufacturers during alleged bid rigging (p 55) . . . "Buy American" clause in Development Loan Fund builds business for American manufacturers (p 56).

ENGINEERING ▶ **Europe's fuel-for-generation patterns are changing** as coal surpluses on the Continent build up, and gas and oil pipelines in Africa and the Near East are completed. Nuclear generation, while progressing, is not now urgently needed. These are some of the things told to delegates to the World Power Conference in Madrid, according to EW Editor Dan Braymer (p 62) . . . Laboratory tests simulate lightning arc effects on 345-kv transmission line in a study of circuit breaker characteristics (p 58) . . . New Los Angeles Airport terminal is served by 34.5 kv underground distribution (p 60).

Politics and Public Power

ECONOMIC OR POLITICS?

The preliminary report on California Gov Edmund Brown's feasibility study of a 500-kv intertie between Bonneville and lower California has raised a number of thought-provoking questions in the minds of experienced powermen. And while the study is supposed to be an **economic** one, the answers to these questions seem to be **political.**

It should be pointed out, however, that what has been submitted so far is strictly, in the words of Sol E. Schultz of H. Zinder & Associates, the Washington-based firm doing the study, "of preliminary nature and remains to be confirmed. . ."

In a statement before the Senate subcommittee on irrigation and reclamation, Schultz said that the report would be submitted in two parts: Stage I, a general and exploratory study, and Stage II, a definitive study.

"We will shortly submit our report of the Stage I study. The Stage II study is to be completed in the early fall of 1960."

Quite apart from some of the findings given in Schultz's preliminary report, a number of observers point out how well this timing of Part II—which will probably contain most of the report's "meat"—coincides with the coming political campaigns.

Here are some of the more important of the findings of the preliminary report:

- The line would be a two-circuit, 500-kv one extending from the Bonneville grid to southern California.
- Serving as a common carrier, it would have a firm capacity of 1.6 million kw and a maximum capacity of 2 million kw.
- The cost, including substations, would require an over-all investment of $200-million; "annual cost . . . would range from $12 million for federal construction to $28 mil-

PROCUREMENT & PRODUCTS ▶ **Present price-cutting is termed "Worse than the 1957 white sale"** by some electrical equipment manufacturers . . . Prices on industrial materials are generally steady **(p 76)** . . . Hunter Engineering Co develops 230-kv tower of tubular aluminum for Southern California Edison . . . Koppers Co designs and builds mobile electrostatic precipitator for Baltimore G&E **(p 80)** . . . Pulsating panels of inflatable neoprene keep coal in bins moving without caking . . . Current transformer of molded construction has no bushings and needs no painting . . . Relay test table checks nearly all protective relays used on electric power systems **(p 93).**

MANAGEMENT ▶ **The businessman in politics shouldn't wave a company banner.** He must operate as a private citizen, in which capacity he is, surveys say, a much more influential figure. Another thing: He shouldn't fear disapproval in political-party work; voters want to hear his views. For details on these and other opinion-survey findings, please see **page 103.**

SELLING ▶ **Infra-red heating in summer?** Yes, at least you ought to be thinking it for use next winter. Commonwealth Ed has taken it window shopping, to the races, and to some of Chicago's best hotels **(p 111).**

NEXT WEEK ▶ **Read EW's 12-page residential lighting report, "Living With Light."**

lion for construction by an investor-owned utility."

- Gross economic benefits are anticipated at $58 million in an average water year. Incremental G&T costs, necessary to obtain average-year benefits, are $29 million. This leaves net benefits at $29 million a year.
- The line would "substantially reduce (if not elminate) BPA's revenue deficiences, alleviating the need for a power rate increase."
- And it would help the "revival of the coal mining industry in Washington."

It is this last point which has a number of industry figures puzzled. For while Schultz pointed out that there are a number of plans "for developing and utilizing the tie which would assure its feasibility," the one he outlined calls for the building of a 300-Mw coal-burning steam plant at Cle Elum, Wash., to provide "dependable peaking capacity."

The questions the powermen ask is this: If the purpose of the tie is to allow BPA to market its **surplus** hydro power in California, how can a steam plant be justified . . . unless it be for political reasons? Specifically, they think they see: (1) A hedge against the future cut-off of Northwest power to California as local markets develop; (2) A "pork barrel" offer to insure the cooperation of politicians in the State of Washington.

They point out also that the length of the proposed line (about 900 miles) makes it, in reality, a high-voltage "backbone" grid covering most of the far West. The fact that the report discusses it as a common carrier, presumably federally-built, reinforces their suspicions that such a grid, rather than a simple tie, is what its advocates are really after.

After studying the report—with its seeming mixture of politics and economics—it's hard to regard their suspicions as groundless.

Nuclear Notes

Dresden Nuclear Power Station reached full 180-Mw power June 29, Commonwealth Edison announced. After operating at or near full power for a few days, Dresden will shut down in preparation for plant performance checking. The plant will be operated at various levels over the next few weeks before going into regular service. A company spokesman said there have been no difficulties in full power testing. The plant is operating under the interim full-power operation permit the AEC issued June 2.

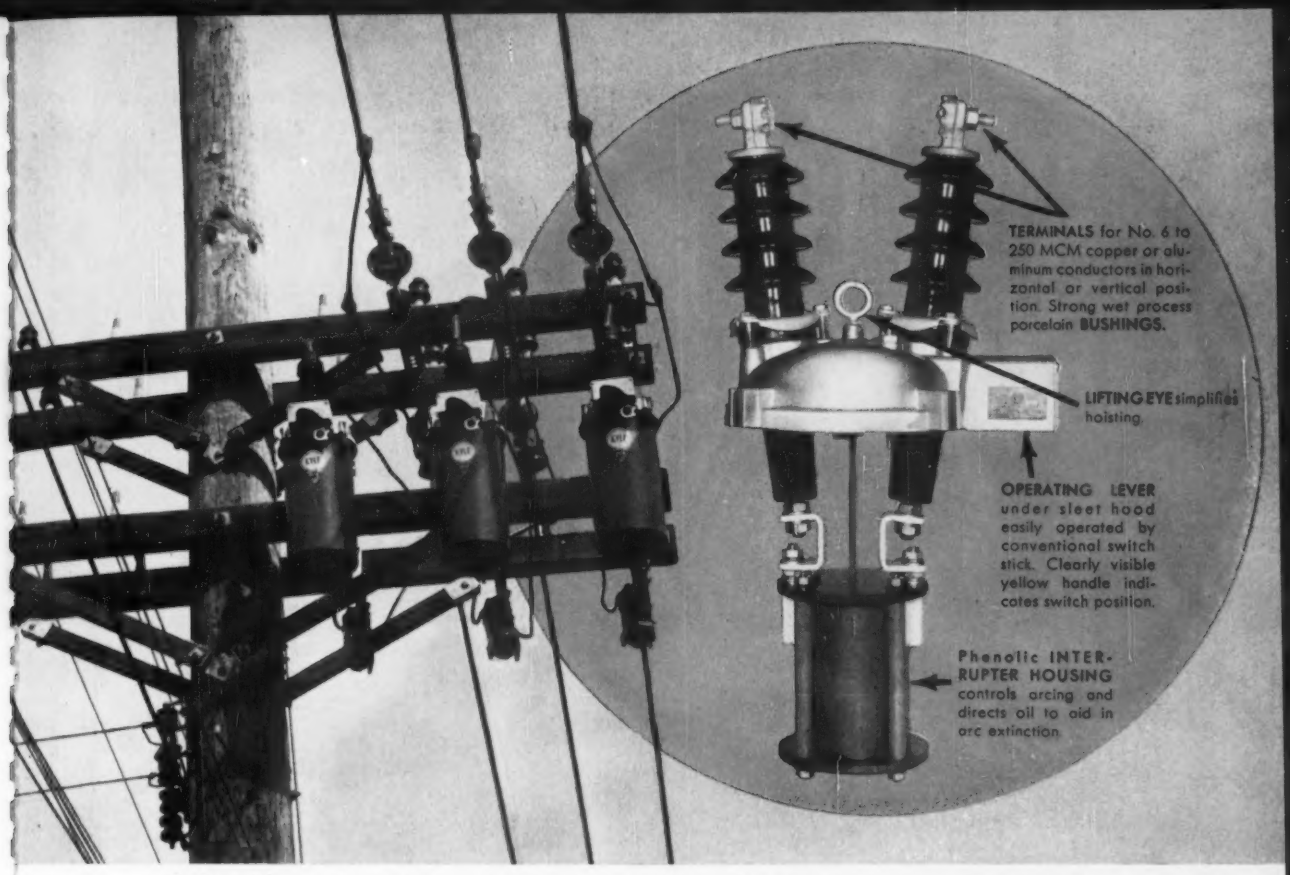
AEC's reactor for the joint Los Angeles-Pasadena plant will be a prototype for a 300-Mw unit. The improved-cycle BWR will furnish steam to the throttle at 550F and 1,000 psi, saturated. The fuel elements, which will use 3%-enriched uranium oxide clad with stainless steel, will incorporate either a burnable poison or a thorium rod in each to flatten the curve of power distribution across the core. Yet to be decided are the question whether this will be a unit for swinging and the choice between a containment sphere and a vapor suppression scheme (EW, July 4, p 33).

PG&E's tests and evaluation of their pressure suppression design have been completed in only seven weeks instead of the three months expected. The utility reported complete success in its tests at Monterey Bay.

Two British atomic construction consortia, General Electric and Simon Carves, have merged after months of negotiations and a report last March that talks had ended. The move comes right after the announcement of a cutback in the British nuclear power program.

Reactor vessel for the Hallam, Nebr. plant rolled off its trailer and across 150 yd of cornfield. The 65-ton, 35-ft-long steel vessel was enroute to the reactor site and was 50 mi short of its destination. At press time it was supposed to be back on its way. Damage has not been assessed, but spokesmen said no delay in the construction schedule is expected.

Study of the costs of nuclear generation is presented in the AEC's "Economic Potential and Development Program as of 1959". The pamphlet, which covers nine reactor concepts, is available for 70¢ from the Government Printing Office, Washington. Also in print is the second of the 8-volume series of reactor descriptions, this one on organic-cooled reactors (EW, June 13, p 18).


TERMINALS for No. 6 to 250 MCM copper or aluminum conductors in horizontal or vertical position. Strong wet process porcelain BUSHINGS.
LIFTING EYE simplifies hoisting.
OPERATING LEVER under sleet hood easily operated by conventional switch stick. Clearly visible yellow handle indicates switch position.
Phenolic INTERRUPTER HOUSING controls arcing and directs oil to aid in arc extinction.

Light weight and compact design make it easy to install the Type J Switch at almost any convenient location.

New Manual 400 Ampere Oil Switch Easily Breaks Rated Load Currents

L-M's new Type J Single-Phase Manually Operated Oil Switch is dependable, rugged, economical, easy to install

This new 14.4 kv, 110 kv BIL, 400 ampere manual oil switch was designed at the request of a utility that needed a load break oil switch of this rating.

The heavy-duty contact mechanism operates under oil. It safely interrupts load currents up to 400 amperes at power factors down to 75% lagging.

Operation is manual, by means of the operating lever under the sleet hood, and a switch stick. The simple, sturdy construction and fast break contact mechanism assures minimum maintenance.

Ask the L-M Field Engineer for Product Bulletin. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.

LINE MATERIAL Industries

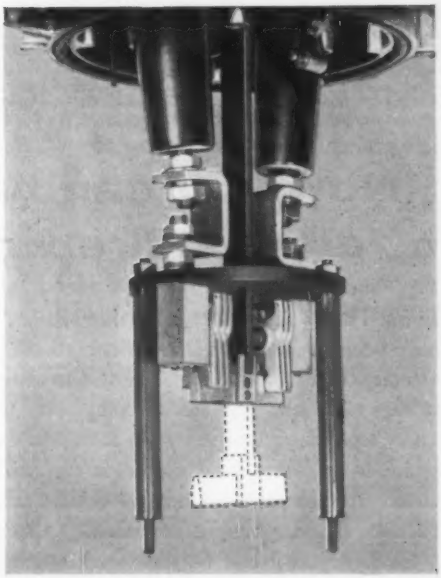
McGRAW-EDISON COMPANY

Reclosers, Sectionalizers, and Oil Switches

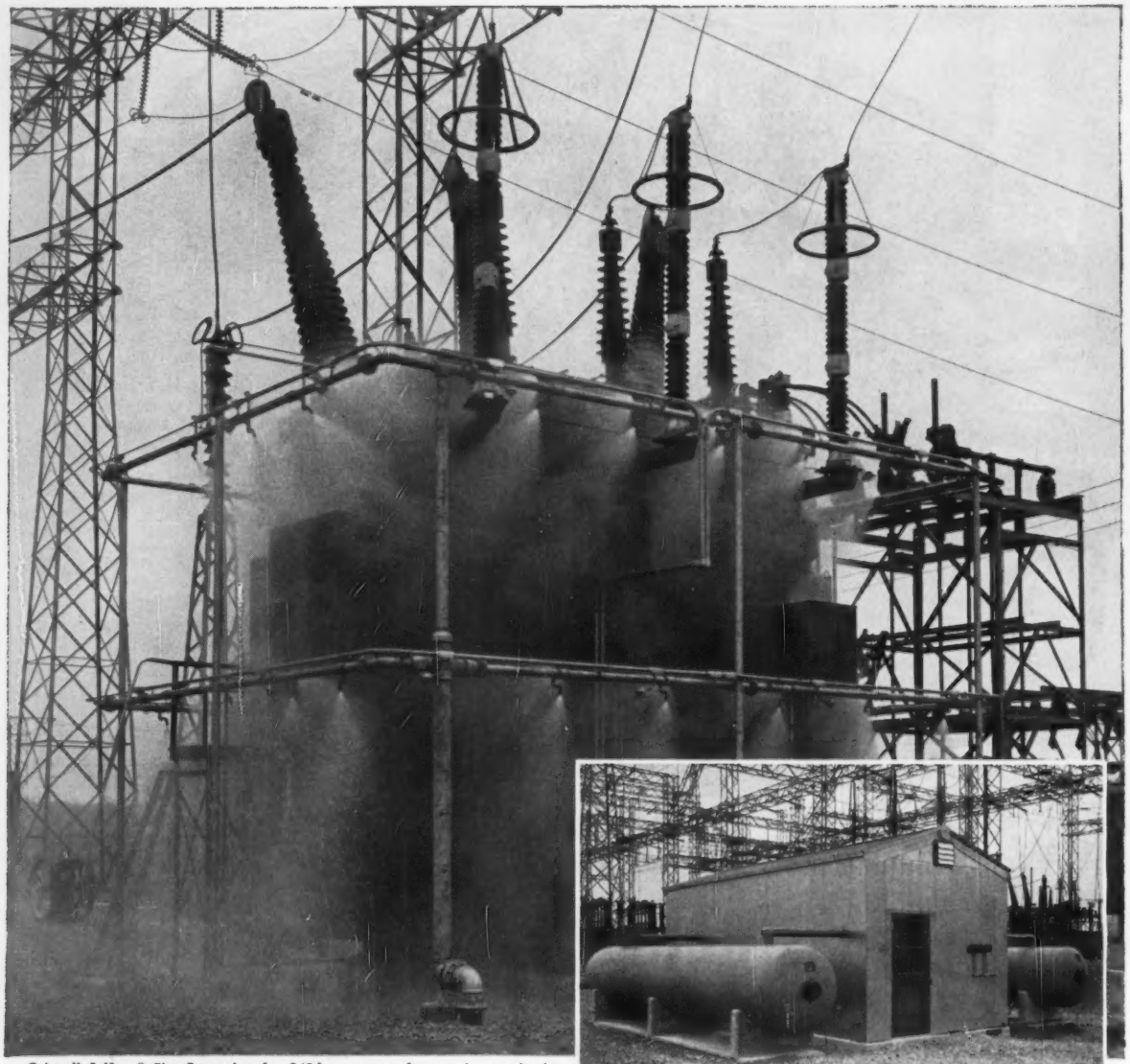
McGRAW EDISON

459

DISTRIBUTION TRANSFORMERS · RECLOSERS, SECTIONALIZERS AND OIL SWITCHES
FUSE CUTOUTS AND FUSE LINKS · LIGHTNING ARRESTERS · POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS · CAPACITORS · REGULATORS · OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS · PORCELAIN INSULATORS · FIBRE PIPE AND CONDUIT



Contact mechanism in closed position. Segmented spring-loaded stationary contacts provide high contact pressure for low resistance and cool operation. Spring-loaded toggle provides fast contact separation and short arcing time.



Grinnell Selfcon® Fire Protection for 345-kv autotransformers is completely self contained. It is of the deluge type, using nitrogen-pressurized water supply. Nozzles on piping looped at two levels thoroughly spray equipment and surrounding ground area.

Water tanks, insulated and heated against freezing, are pressurized (to maintain 50 psi minimum at nozzles) by nitrogen bottles inside the valve house.

Now you can have water spray protection against fire without public water supply

Limited water supply fire protection systems by Grinnell have been installed for transformers at two substations of a large midwestern utility. The system consists of water storage tanks and cylinders of compressed nitrogen gas, safely located out of the hazard area, and connected by piping to the water spray nozzles in the areas to be protected. Automatic fire detecting devices are connected back to the nitrogen cylinder release.

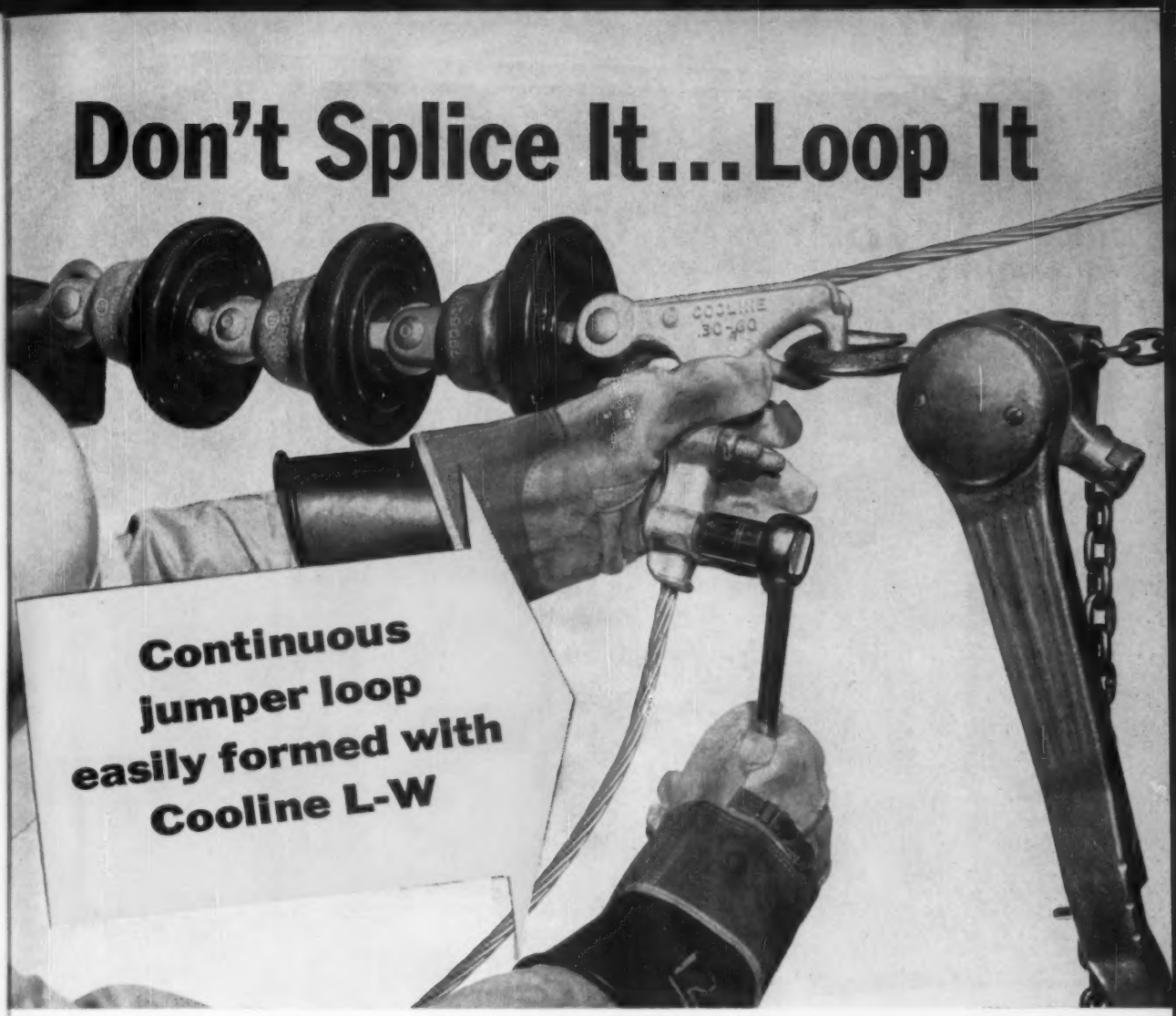
Should a fire break out, nitrogen is quickly released into the water tank, raising the pressure so that water is discharged from the spray nozzles with maximum extinguishing effect. The water capacity of the system provides a safety factor well in excess of extinguishing time.

Grinnell first introduced this type of water spray protection in America, and maintains that leadership through continuing research. An engineer from Grinnell's Fire Protection Division will gladly explain in more detail how the system works. Phone or write Grinnell Company, Providence 1, R. I. Branches in principal cities.

GRINNELL

AUTOMATIC FIRE PROTECTION SINCE 1870

Don't Splice It...Loop It



When Cooline L-W clamps are used on distribution deadends, trouble-free jumper loops can be formed quickly, efficiently without cutting or splicing the conductor.

Low-cost Cooline L-W clamps offer many of the advantages of heavy duty Cooline clamps for transmission lines, but are especially designed for the distribution and sub-transmission trend toward larger conductors and shorter spans.

The L-W clamp has a powerful snubbing action which has high holding power without crushing the conductor. The six models in the series cover a range from .2 to 1.3 inches in conductor diameter with more than adequate ultimate strengths.

Installation is simple since no special tools or skills are required. A few minutes with a standard wrench and Cooline L-W clamps are ready to serve the life of the line.

Just look at these many advantages: design that permits the use of continuous jumper loop without splicing conductor . . . convenience . . . high, maintained holding power . . . low installed cost. And the aluminum construction minimizes electrical losses and conductor heating.

It's certainly worth your time to investigate the many advantages of Cooline L-W clamps now.

OHIO BRASS COMPANY, MANSFIELD, OHIO

This product distributed by GraybaR ELECTRIC COMPANY

Ohio Brass

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PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
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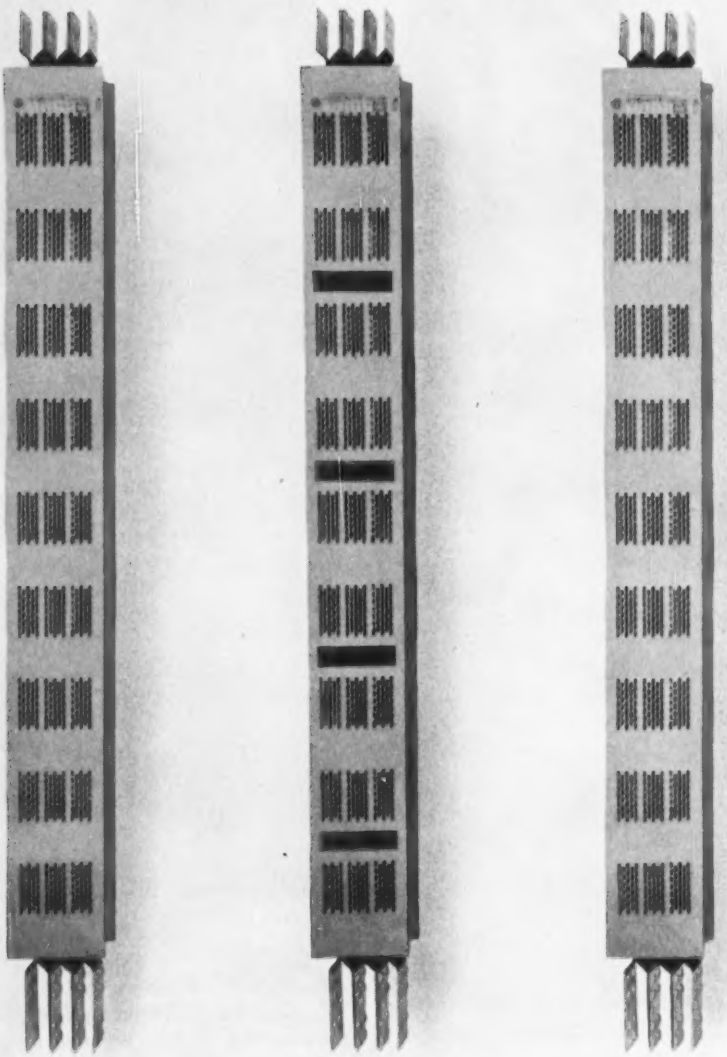
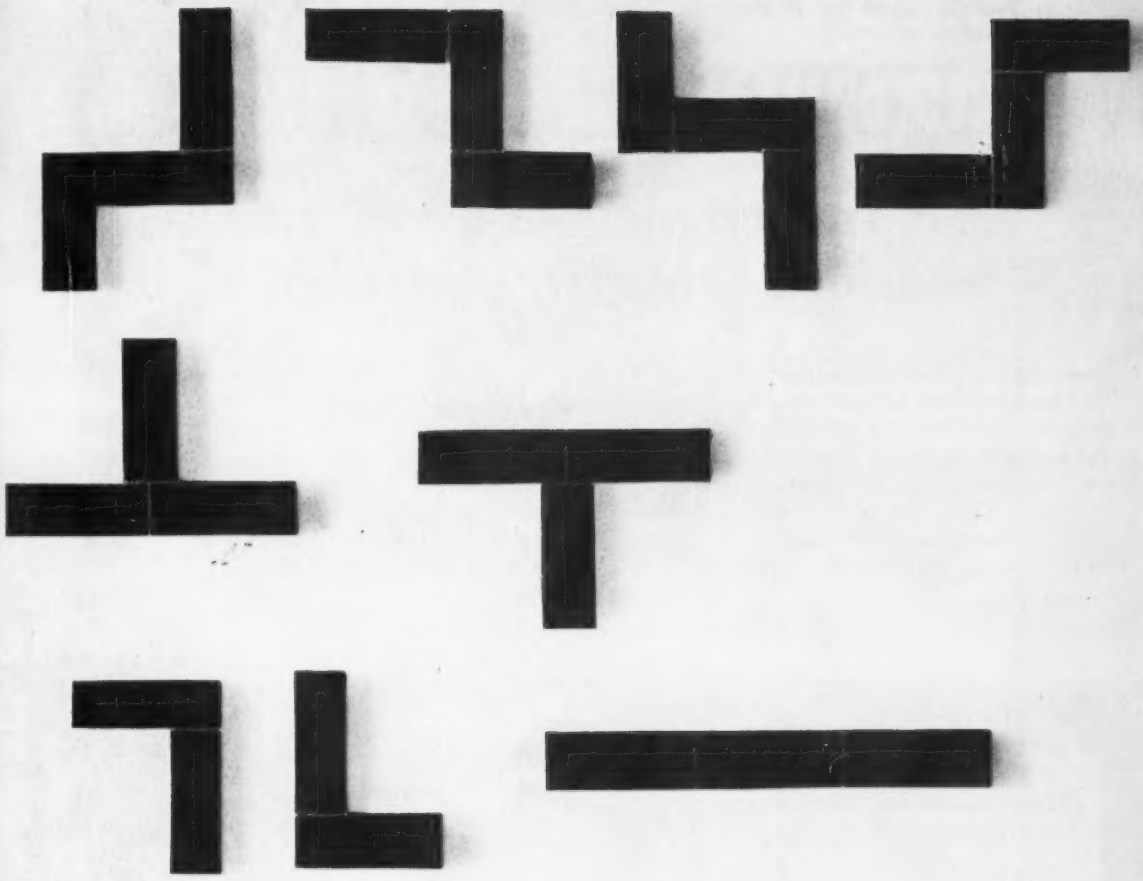


3 will gey

Three straight lengths of FPE duct create all nine combinations shown – *right on the job.* Federal Pacific low impedance or low impedance plug-in ducts bolt together for tees, elbows and offsets in limitless application. And your savings are just beginning: no delivery delays... installation costs cut as much as 30%... flexibility and expandability multiplied several times over. What's



e you nine

more, you can relocate in new layout, and again, no need to wait for factory fittings. All this because Federal Pacific designs bus duct on the modern modular principle, on all low-impedance, plug-in and weather proof duct. If you use duct – FPE is the only duct to use. Write for Bulletin 3-125, Federal Pacific Electric Company, Department FP-1, Newark 1, New Jersey

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FPE

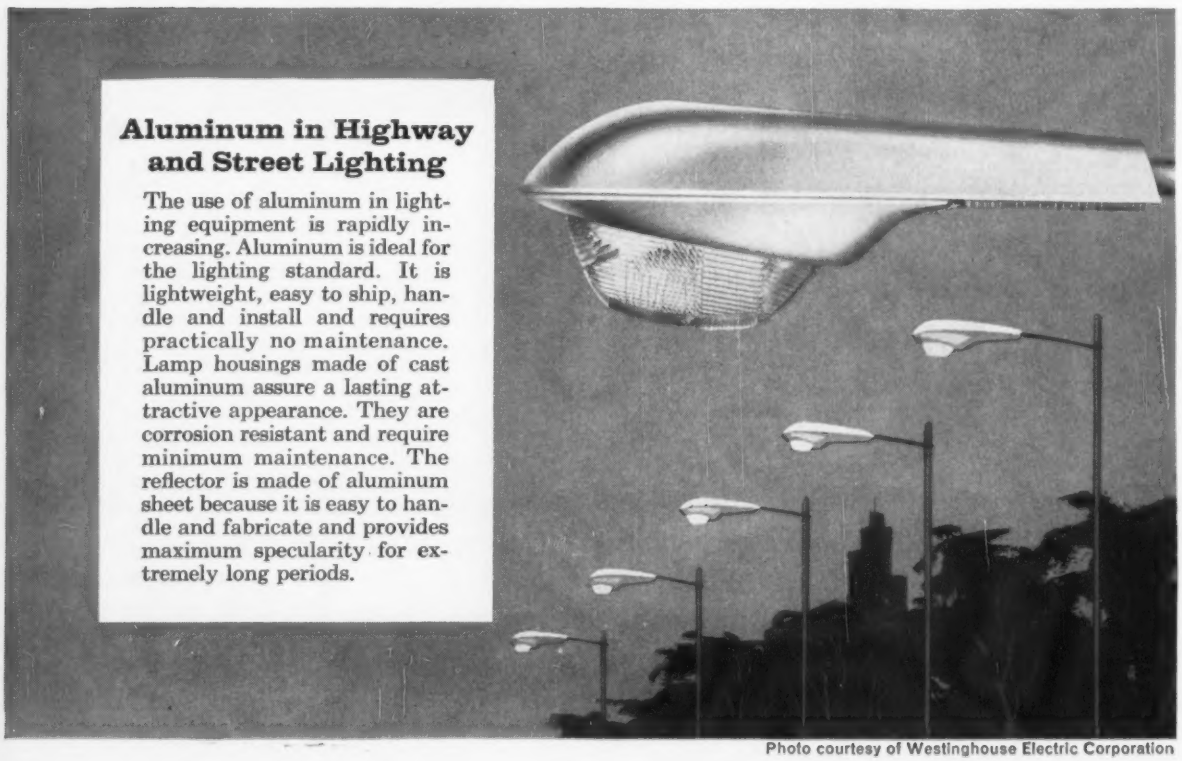
growth through creative energy

SPECIFY ALUMINUM IN ELECTRICAL EQUIPMENT

...it improves performance, reduces weight, cuts costs

Regardless of whether you purchase or manufacture electrical equipment, aluminum's unique combination of advantages can be of value to you. Some of these advantages are: low cost, minimum maintenance, easier installation, attractive appearance, high electrical conductivity, light weight, resistance to corrosion, high thermal conductivity, strength, ease of fabrication, good availability and high scrap value.

Reynolds Engineers are available to help translate these advantages into better products for the electrical industry. Contact your nearest Reynolds office or write *Reynolds Metals Company, P.O. Box 2346-EL, Richmond 18, Virginia.*



Aluminum in Highway and Street Lighting

The use of aluminum in lighting equipment is rapidly increasing. Aluminum is ideal for the lighting standard. It is lightweight, easy to ship, handle and install and requires practically no maintenance. Lamp housings made of cast aluminum assure a lasting attractive appearance. They are corrosion resistant and require minimum maintenance. The reflector is made of aluminum sheet because it is easy to handle and fabricate and provides maximum specularity for extremely long periods.

Photo courtesy of Westinghouse Electric Corporation

Photo courtesy of Allis-Chalmers Manufacturing Company

Aluminum in Outdoor Switchgear

Extruded aluminum sections that interlock to form structurally reinforced panels reduce labor costs, provide strength and rigidity in outdoor switchgear housings. Because aluminum resists corrosion in salt air and contaminated atmospheres, units never need protective painting — retain their original attractive appearance. And because aluminum is light in weight, panel sections can be removed by one man without use of a crane.

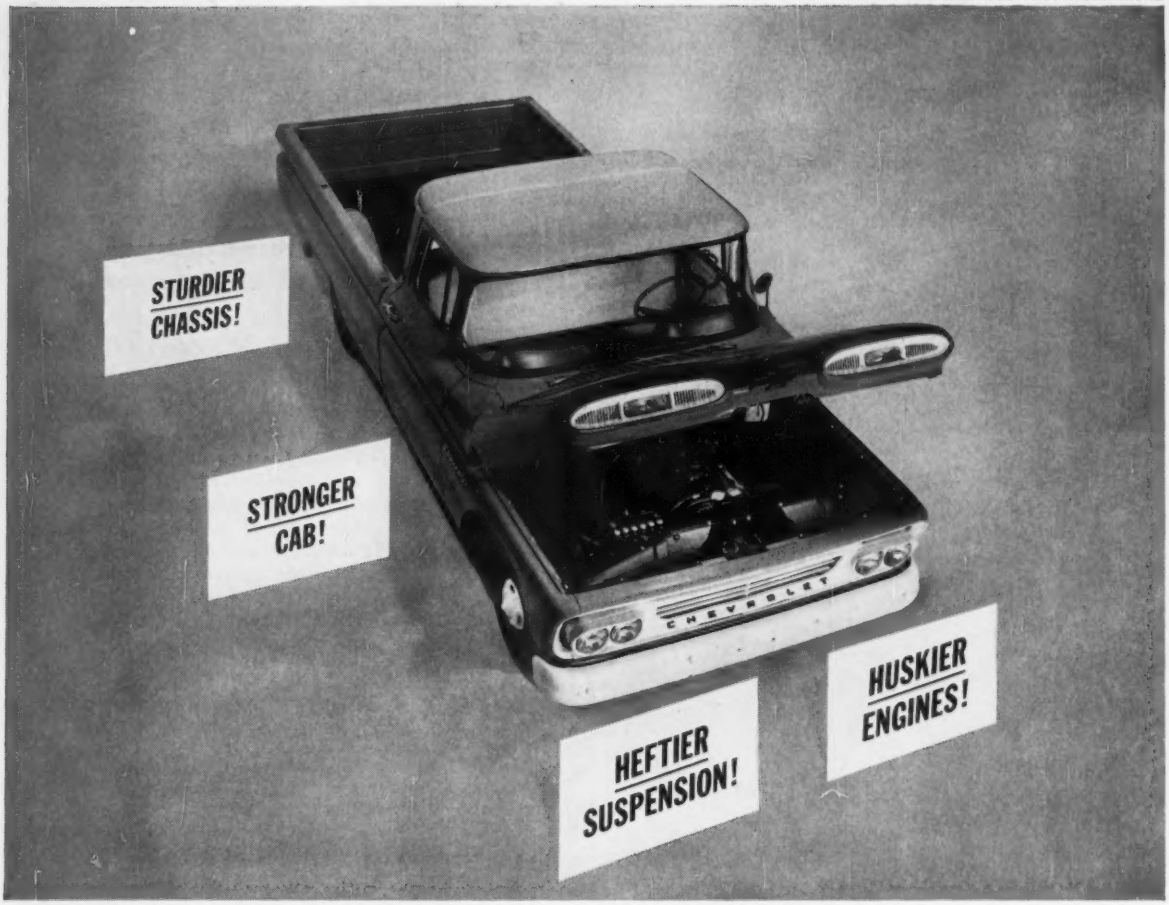
Aluminum in Meters

There are several aluminum applications in meters that help make them attractive in appearance, easier to handle and install and to perform accurately. Aluminum die castings used in large internal meter frames are lighter than other nonferrous die castings and have high strength and dimensional stability. Aluminum is used in rotors, gears, dial faces, name plates, rings and screws because it is easy to fabricate or machine, takes an excellent finish, and its light weight means less bearing load on moving parts which adds to meter accuracy. Aluminum is also ideal for meter parts because it is non-magnetic, corrosion-resistant and is more economical because it provides more pieces per pound.

Photo courtesy of Duncan Electric Company, Inc.

REYNOLDS ALUMINUM

Watch Reynolds TV Shows: "Bourbon Street Beat" and "Adventures in Paradise"; and, resuming in October, "All Star Golf"—ABC-TV



CHEVY'S PUT TOGETHER TO STAY TOGETHER ...TO CLAMP DOWN ON COSTS!

Here are the strongest truck components known ... assembled lastingly, with care and craftsmanship. It's Chevy's way of making sure you get maximum truck life; extra assurance of higher profits because of far fewer maintenance and repair charges.

NEW STRONGER CAB CONSTRUCTION. New steel braces reinforce cab underbody, help keep cab tight and solid. Husky new box-section pillars frame door openings, keep doors in lasting alignment. New roof panel is double walled for extra strength.

NEW STURDIER CHASSIS COMPONENTS. New stronger *frames* with rigid box-section rail design increase torsional stiffness up to 1100%! And *brakes* are bigger for longer brake life and safer stopping. Bigger capacity *axles* and *suspensions* boost load-carrying ability.

TRUCK-BUILT V8's AND 6's. Components such as brawny forged steel crankshafts, long-lasting precision bearings and oil bath air cleaners provide sure dependability that keeps your maintenance costs *down*.

NEW HEFTIER SUSPENSION smooths the ride; protects everything from wear and tear. Independently suspended front wheels, rigid control arms and strong torsion bar springs take tough runs with strength to spare.

■ Chevrolet's building 'em *tough* these days, even tougher than ever before. And that's saying something when you consider how Chevrolet trucks have stood up over the years. Here's a typical example:

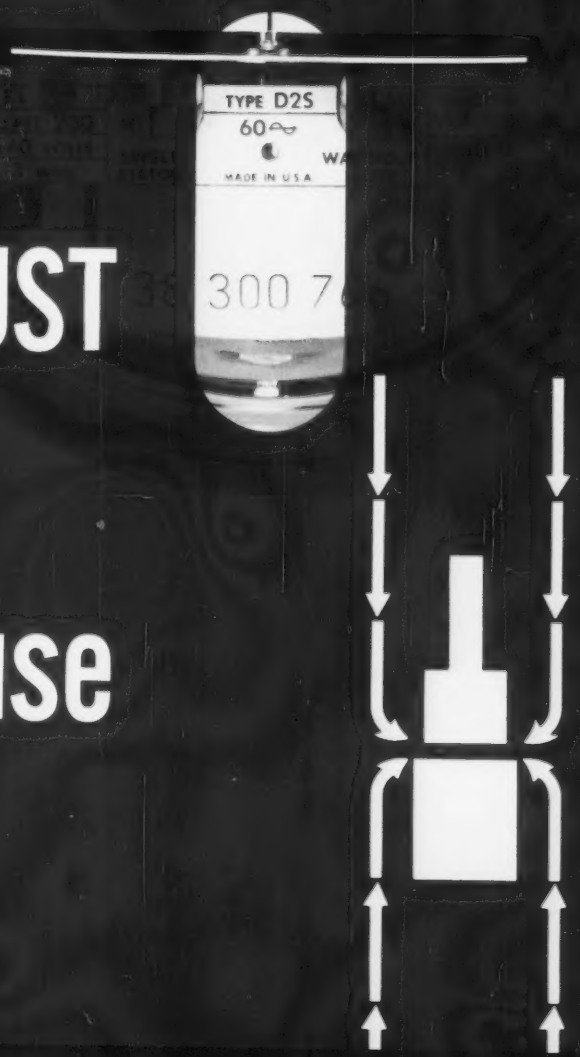
101,000 miles on a truck-busting job—and still going strong! The strength and stamina of this Chevy pickup has paid off handsomely for the Mitchell Insecticide Company, Inc., of Fairfax, S.C. In rugged service, hauling maximum loads of nitrogen throughout the southeastern states, this Chevy has logged 101,000 miles with no mechanical trouble at all.

That kind of performance has been Chevy's stock-in-trade for years; and the '60's are designed to put out even more of it. See your dealer for all the details. . . . Chevrolet Division of General Motors, Detroit 2, Mich.

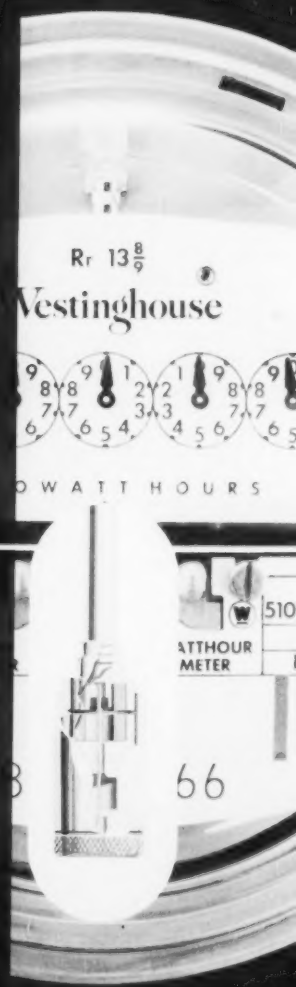
1960 CHEVROLET STURDI-BILT TRUCKS

CHEVROLET

Now! the Better Meter you dared us to build... New MAGNETHRUST by Westinghouse



Now! the Better Meter you dared us to build... New MAGNETHRUST by Westinghouse



For some time it has see
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uite. The product of our
t the challenge—to design
etter meter—is announced
name is MAGNETHRUST®.
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NEW MAGNETHRUST— PRODUCT OF 15 YEARS OF MAGNETIC BEARING RESEARCH

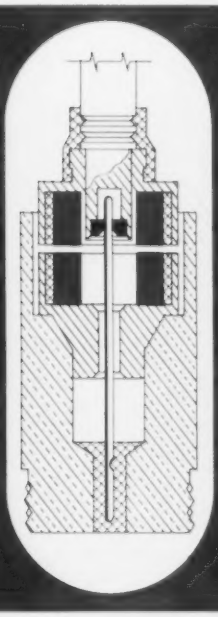
At the heart of this new Westinghouse meter is a revolutionary bearing system employing magnetic thrust, made practical for the first time by the use of an outstanding permanent magnet material—barium ferrite. Only known magnetic material to show no change at maximum magnetization without normalizing.

In the new MAGNETHRUST meter, the disc and shaft actually float on a magnetic field. With this new principle, Westinghouse adds new areas of perfection to already impressive standards of meter performance.

The MAGNETHRUST meter is tamperproof . . . no known service conditions can demagnetize the barium ferrite magnets. High ambient temperature has no effect whatever on the MAGNETHRUST meter. *These are exclusive advantages.*

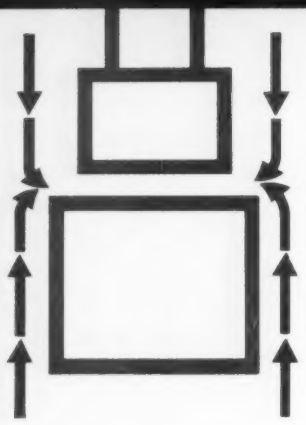
The bearing system is designed for minimum vibration and bearing pressure, offering quiet operation and a lifetime of service. Barium ferrite provides high magnetic energy to permit smaller, lighter magnets and extreme resistance to demagnetization that assures extraordinary stability.

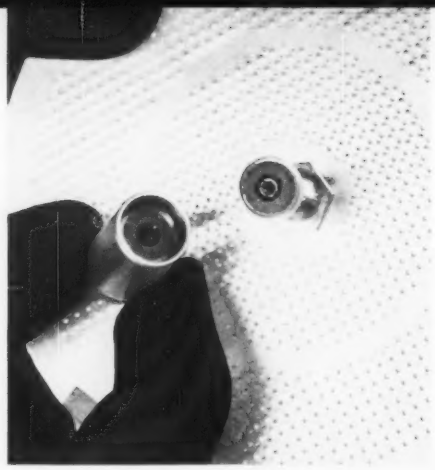
Now, over a half century of meter bearing research brings you new measures of operational perfection and revenue protection you can get in no other meter.



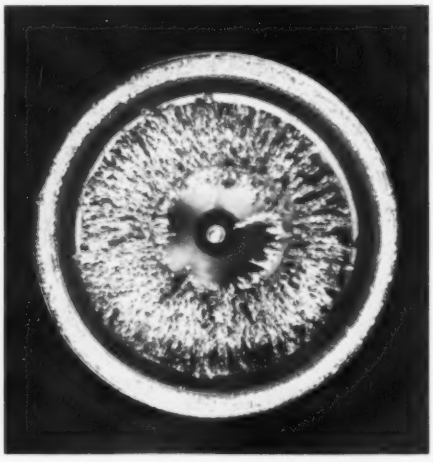
YOU CAN BE **SURE**...IF IT'S

Westinghouse





NEW MAGNETHRUST BEARING . . . floats on a magnetic cushion, never wears, lengthens useful meter life.



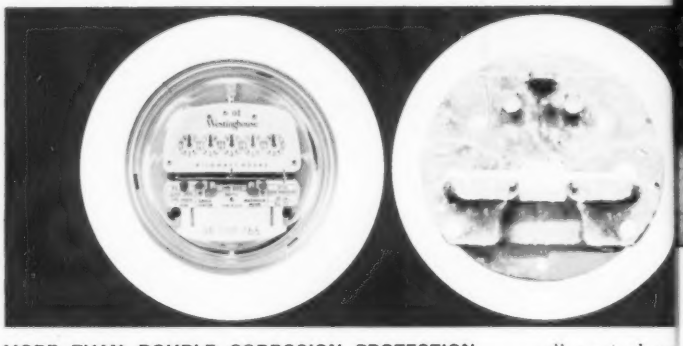
SELF-CLEANING BEARING . . . note how iron filings thrown on the magnet face lie flat, cannot clog the bearing.

Superior stability provided by MAGNETHRUST

Two ring-shaped barium ferrite magnets are the heart of the new Westinghouse MAGNETHRUST bearing. These are mounted in steel flux return cups. One is located in the lower mount and the other on the bottom end of the disc shaft. Facing surfaces of the magnets are magnetized north. The result is that exposed magnet faces oppose one another. . . the disc and shaft actually float on a magnetic cushion.

This bearing arrangement is highly reliable and permanent because the magnets themselves are inherently stable. They resist demagnetization when subjected to any external magnet or surge current including lightning. The bearing system is self-cleaning . . . magnetic particles cannot clutter the gap.

Ask your Westinghouse representative for a demonstration of this truly new principle of meter design. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.



MORE THAN DOUBLE CORROSION PROTECTION . . . all parts have finishes which are tested separately and together by immersion in sea water, exposure to salt spray, dry and moist atmospheres up to 100% humidity.

TRUE LIGHTNING PROTECTION . . . exclusive De-ion® arrester gaps discharge lightning harmlessly, outside the meter to ground. Alnico damping magnets tested for lightning surges to 40,000 amperes.

YOU CAN BE SURE... IF IT'S Westinghouse

JI-40531

Litho in U.S.A.

Pre-Engineering by **KAISER ENGINEERS** answers basic plant expansion questions...

Raw Materials?

Your final decision to expand or build results from a series of important individual decisions. Raw material availability is one of them. Independent analysis of all aspects of your proposed program is the *Pre-Engineering* service offered by Kaiser Engineers. In addition, KE designs and builds all types of power plants—steam-electric, gas turbine, combined cycle, nuclear and hydro-electric. Whatever your requirements . . . from Pre-Engineering analyses through plant design and construction . . . Kaiser Engineers brings world-wide experience and ingenuity to their solution.

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suspension insulators

with C.I.S.*

control "necking" corrosion of insulator pins

"Necking" corrosion of suspension insulator pins is a familiar problem with many utilities. In recent years, O-B engineers have received insulators similar to the one shown at the upper right from heavily contaminated areas in West Virginia, Pacific coast, Ohio, Pennsylvania, Florida, the Gulf coast, and elsewhere.

The necked down pins of these insulators represent not only an outright loss to the costly thievery of corrosion, but also a threat to safety and income.

But it doesn't have to happen - - and it doesn't take expensive "specialties" to prevent it from happening!

Futura's Corrosion Intercepting Sleeve, during 16 years of service in heavily contaminated atmospheres, has been *proved* effective against this form of corrosion.

As illustrated below, the Corrosion Intercepting Sleeve acts as a drip-shield for the pin, preventing moisture (and the corrosive salts dissolved in it) from draining continuously down the exposed shank of the pin.

Of the hundreds of Futura insulators exposed to severe contamination for up to 16 years, not one shows the characteristic and well-defined signs of necking corrosion!

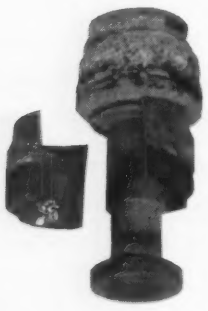
Is this the solution to one of your problems? . . . isn't it worth looking into?

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

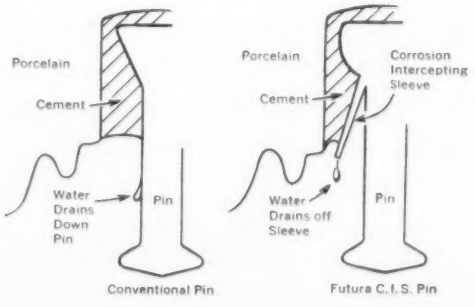
HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES



Left: Removed from a sound insulator after 16 years of service in a heavily contaminated atmosphere, this prototype Futura pin shows absence of corrosive attack. Narrow rim of the sleeve itself sheds all but the smallest droplets of moisture (which evaporate quickly), does not sustain continuous or massive attacks.

Right: In a conventional insulator, corrosive salts dissolved out of air-borne contaminants are allowed to drain down the exposed shank of the pin. In the Futura insulator, this drainage path is interrupted by the Corrosion Intercepting Sleeve, protecting the pin from continuous and massive attack.

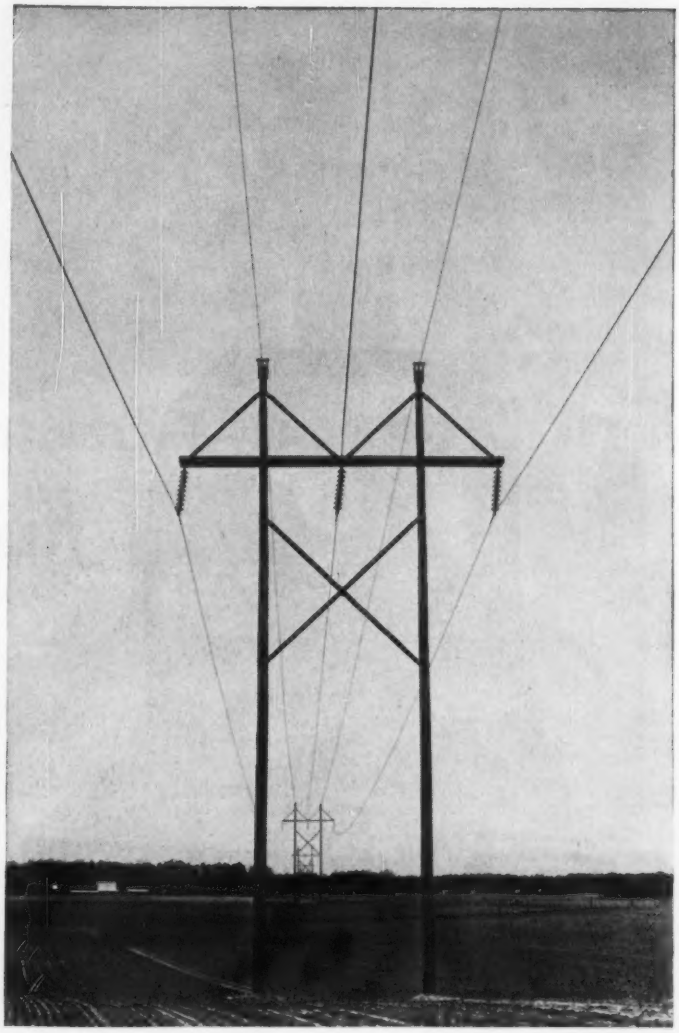


Pin of this conventional insulator shows advanced stage of necking corrosion after 30 years' exposure in a heavily contaminated atmosphere. Corrosive salts, dissolved out of air-borne contaminants by moisture, collected on the underside of the porcelain disc and then diffused across the cement joint to drain down the exposed shank of the pin.

Futura insulator, with the exclusive Corrosion Intercepting Sleeve (C.I.S.), prevents massive corrosive attacks on the insulator pin. Sleeve acts as an umbrella (see sketch at left) to divert corrosive salts from their customary drainage path down the exposed shank of the pin.

* Corrosion Intercepting Sleeve

Bethanized Strand protects 54-mile power line



The conductors of this 54-mile, 138 kv line, which is owned by The Eastern Shore Public Service Company of Maryland, are protected by two overhead ground wires of ⅜-in. ASTM A-363 7-wire Bethanized "C" coated strand. The line, on the Delmarva Peninsula, originates near Millington, Md., and terminates at Vienna.

You can obtain just about any degree of protection against corrosion when you use bethanized strand. In the "A" weight, bethanized coatings are adequate for normal atmospheric conditions. They are also furnished in "B", "C" and "D" weights for added protection against corrosion in industrial and marine atmospheres.

The "D" coating, furnished in common, Siemens-Martin and high-strength grades, contains four times the weight of the "A" coating. The "C" coating is three times the weight of "A"; the "B" coating is twice the weight of "A". Each coating is 99.9 per cent pure zinc, and is applied by our unique electrolytic process which insures uniformity.

For full information on bethanized strand, get in touch with the nearest Bethlehem sales office.

Steel

for Strength
. . . Economy
. . . Versatility

BETHLEHEM STEEL

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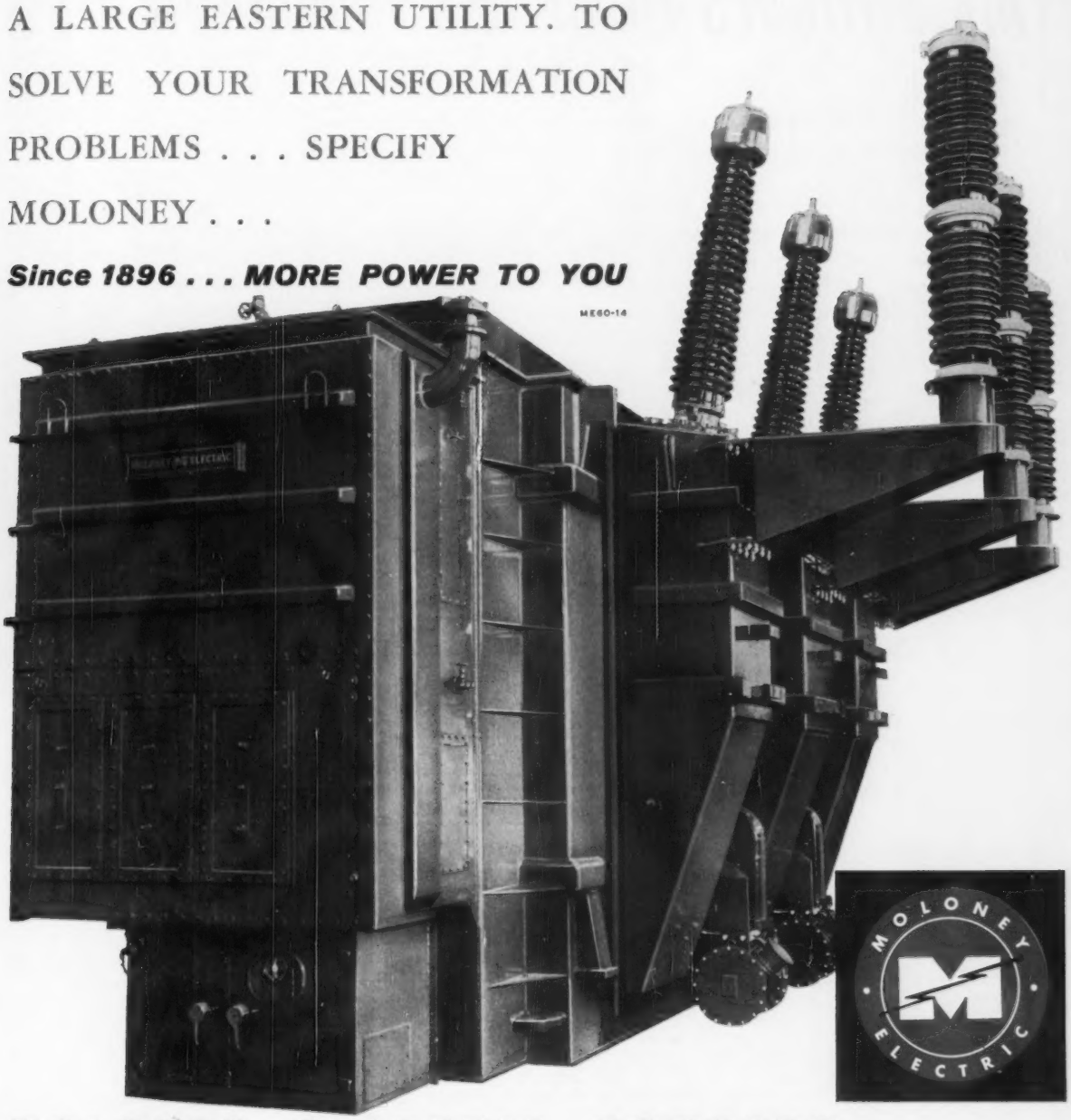
BETHLEHEM STEEL

100,000 KVA, CLASS FOA, THREE PHASE, SIXTY CYCLES, LTC TRANSFORMER, RATED AS FOLLOWS . . . H.V., 220,000 GRD. Y/127,000 VOLTS; L.V., 36,000 GRD. Y/20,775 VOLTS; T.V., 13,800 VOLTS DELTA @ 35,000 KVA; LTC ± 10% HV REGULATION IN 32 5/8% STEPS. NOW IN SERVICE FOR A LARGE EASTERN UTILITY. TO SOLVE YOUR TRANSFORMATION PROBLEMS . . . SPECIFY MOLONEY . . .

Since 1896 . . . MORE POWER TO YOU

ME60-14



MOLONEY ELECTRIC COMPANY . . .

Transformers for Utilities, Industry, and Electronic Applications

FACTORIES: ST. LOUIS 20, MO., AND TORONTO, ONT., CAN. • SALES OFFICES IN ALL PRINCIPAL CITIES

SOUTHERN STATES OFFERS THE MARGIN OF SAFETY NEEDED IN AIR SWITCHES TODAY AND TOMORROW

The switches shown here are brand new. They will pass any industry standard short circuit test with ease.

But what about 10 years from now, when the switches are covered by grime and grit; when operation has caused some wear of the contact surfaces?

What's going to happen *then*, when heavy fault currents occur? Are the critical current interchange points going to stand up to the task of protecting your valuable load?

These are questions that must be answered by engineers concerned with today's complex transmission and distribution problems. Basic switch design, quality of construction, and the type of contacts used deserve critical appraisal. The contact is most important.

Southern States provides extra security for its air switches by using Amplitact® contacts. Since this contact was introduced about 10 years ago, *not a single one has ever failed under short circuit.* This is the margin of safety you need.

Look beyond the catalog and technical data—look to the future capabilities and trustworthiness of the switch you buy.

High density, high load areas demand maximum protection against higher values of fault current. That is why so many utilities throughout the nation are using Southern States Air Switches with Amplitact Contacts.

Get the facts from your Southern States representative, or write direct for details.

SHORT CIRCUIT TESTS OF SOUTHERN STATES SWITCHES EQUIPPED WITH *AMPLITACT* ® CONTACTS

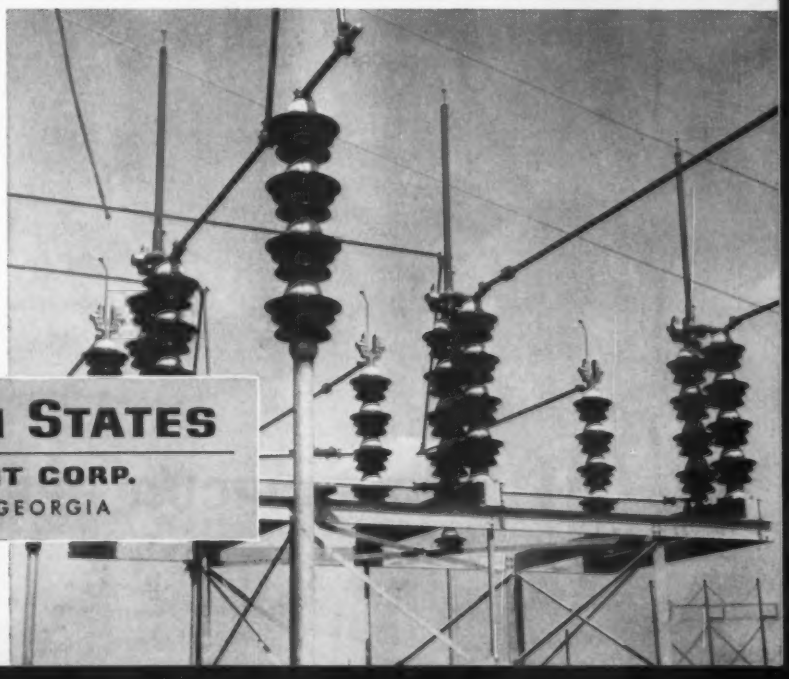
KV	CONT. CURRENT RATING	TEST SHOTS			TEST RESULTS
		NO. OF TESTS	RMS AMPERES MAXIMUM	RMS AMPERES MINIMUM	
161	1200	12	62,900	51,200	No Damage
		6	79,000	60,000	No Damage
		6	80,300	69,700	No Damage
		9	84,500	74,600	No Damage
		9	98,000	78,400	No Damage
		3	106,800	89,800	Pressure Marks*
161	2000	7	70,500	58,600	Pressure Marks*
161	1600	8	70,000	53,700	No Damage
		1	114,000		Pressure Marks*
		6	82,000	65,300	Pressure Marks*
161	1600	5	106,100	99,500	Pressure Marks*

**The term "Pressure Marks" should in no way be construed as an indication of damage to the contact. Instead it points up the extremely high contact pressures which were developed by* AMPLITACT® *and were anticipated in the design of this type contact.*

KEEP PACE WITH ELECTRICITY

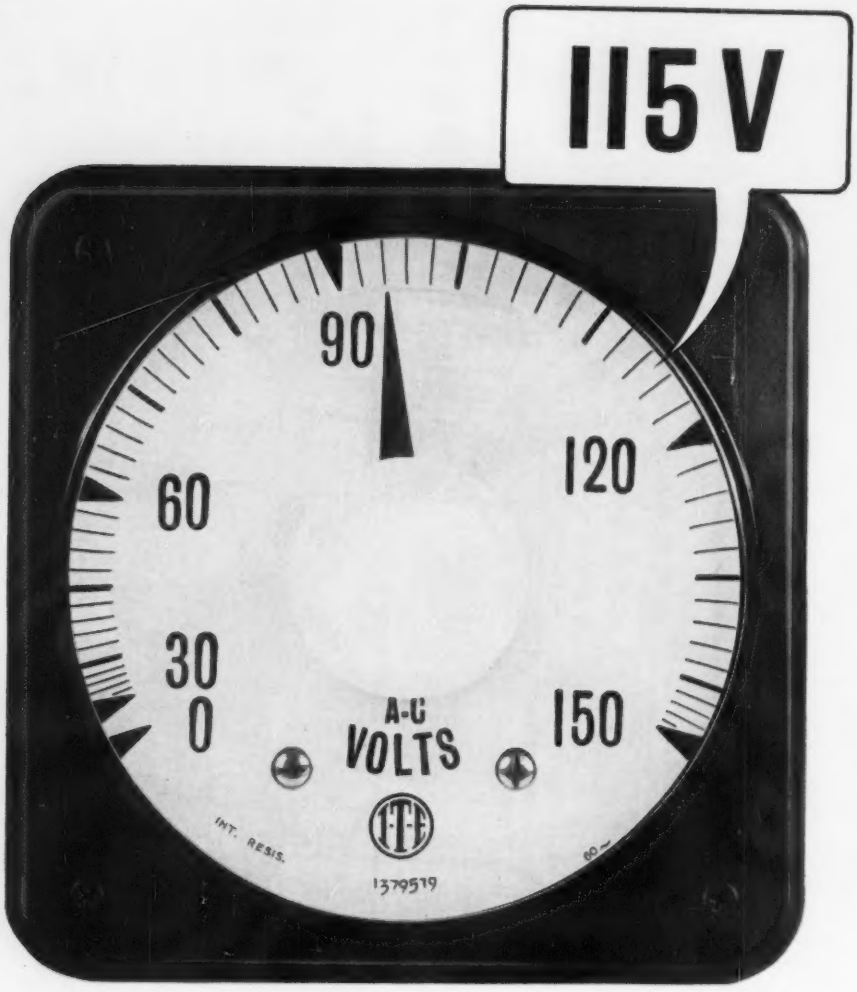
ABOVE Consolidated Edison's Buchanan Substation is shown here during construction. Southern States' 161 KV—2000 amp Type RDC double side-break switches and 230 KV—1600 amp Type WAG switches (not shown) are the Amplitact equipped air switches used on this station.

AT RIGHT Houston Lighting & Power Company uses 161 KV—1200 amp Type WAG air switches on this modern substation.

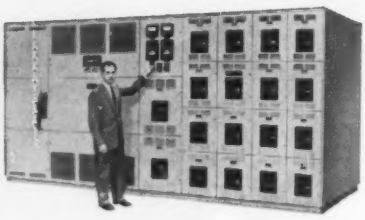


SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

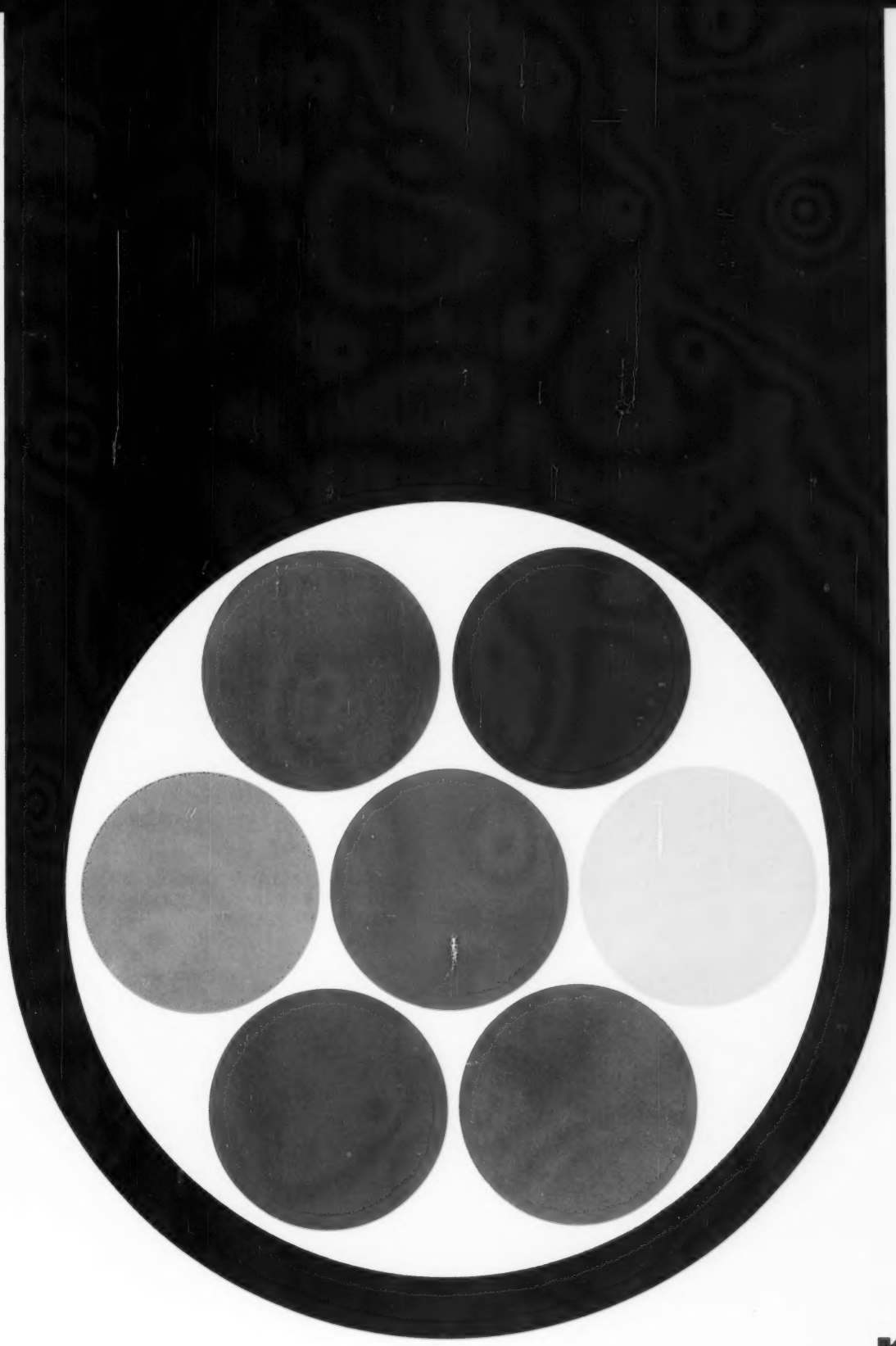


"But I was positive we didn't need another substation!"



MORAL: For good voltage regulation and better operating efficiency, put a secondary unit substation in each load area. And for complete information on today's most value-packed line of substations, write for Bulletin 3104-1A, I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton Street, Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY



IN ELECTRICAL WIRE & CABLE . . . **THE SPARK OF QUALITY IS KAISER WIRE EXPERIENCE**

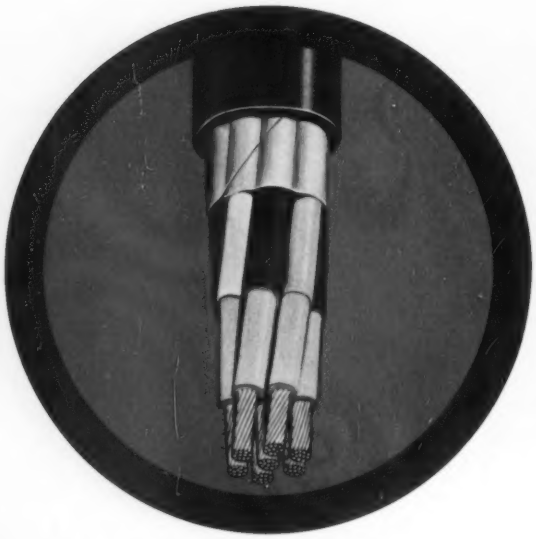
CONTROL CABLE... 28 YEARS OF PERFECT INSULATION SERVICE

KAISER MASTER LAYTEX® CONTROL CABLE has never known a reported insulation failure!...and the introduction of patented Laytex-Resin promises to improve upon this 28-year record of perfection!

Laytex-Resin is the combination of Laytex insulation with a specially-compounded resin layer over the insulation that eliminates the bulk of braided coverings. It brings the following advantages over extruded constructions:

Smaller diameter, to expand service without enlarging ducts...less weight...increased flexibility...proven greater insulation protection against acids, alkalies, flame, fungus, water, oil, ozone and light...uniform protection free of thin spots...can't wick moisture or fray...easier splicing...brighter color coding and longer lengths per reel.

SPECIFY 935-S. ASK FOR KAISER CONTROL CABLE BOOKLET.



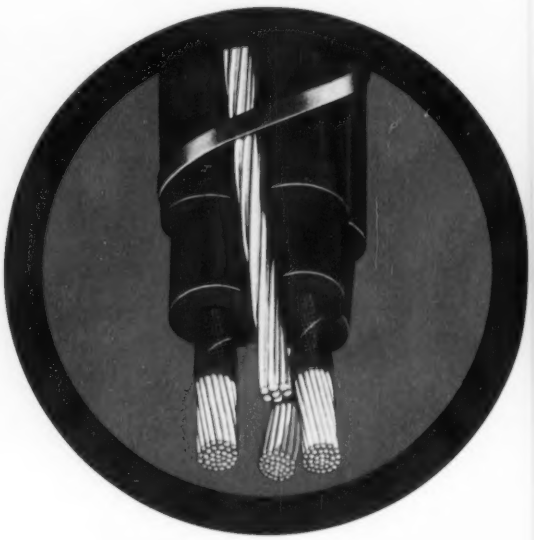
POWER CABLE... 16.4 TIMES MORE OZONE RESISTANCE

KAISER GRIZZLY® POWER CABLE is the only power cable to resist 6000 hours of high ozone shock test—outlasting 9 leading brands tested!

Several samples of each unshielded 5KV cable were placed with a "U" bend resting on a grounded metal plate. A conductor-to-plate potential of 40,000 volts was applied until all cables failed. Four brands failed immediately. The last competitor gave out 432 hours before the first Kaiser cable. Kaiser Grizzly samples went on to last over 6000 hours . . . 16.4 times longer than the test average of best performances . . . 2.4 times the life of the nearest competitor.

The reason: A superior combination of Kaiser insulation and jacketing. In power cables it represents a major victory over the main cause of failure—dielectric breakdown due to ozone.

AVAILABLE IN A WIDE RANGE OF SIZES AND SPECIFICATIONS FOR OVERHEAD AND UNDERGROUND HIGH-VOLTAGE APPLICATIONS.



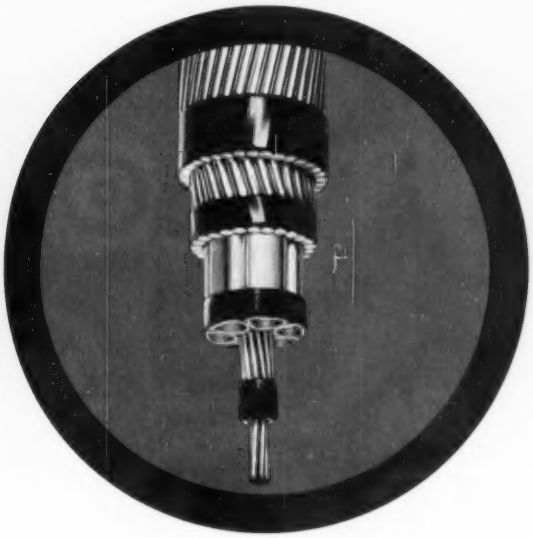
K/W EHV...1000 MILES OF 345KV...MUCH MORE IN THE FUTURE

KAISER ALUMINUM EHV CONDUCTORS span more than 1000 of the 2500 miles of extra high voltage transmission lines now in service in this country.

As system voltages of 345KV, 460KV and higher become more common, Kaiser offers specialized conductor design, manufacturing, and installation experience.

Kaiser engineers are actively engaged in utility experimental EHV installations... field measurements of corona loss as it affects radio and TV interference . . . bundled conductor and accessory analysis . . . problems of galloping conductors... vibration and tension studies . . . and other research toward better conductor design and installation.

As a result, standard paper expanded core conductors—as well as such designs as hollow core, "I" beam, and tubular expanded core—have been manufactured and subjected to torturous field installation procedures for evaluation.



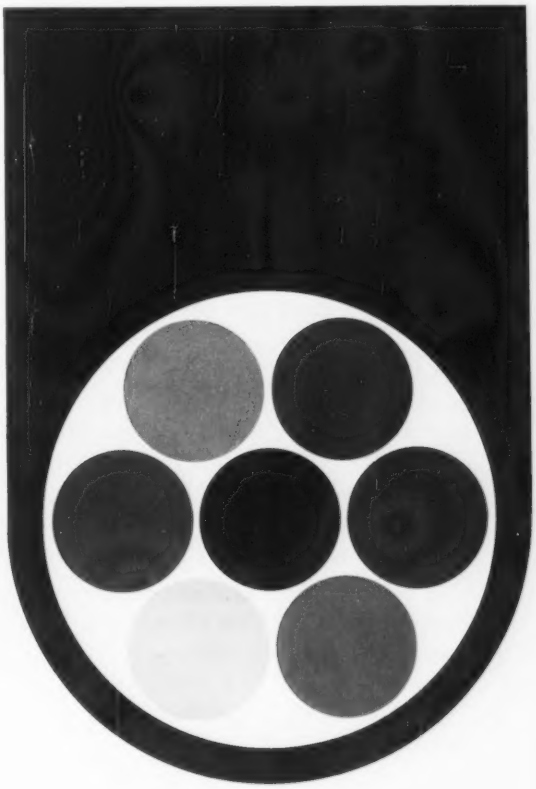
IN ELECTRICAL WIRE & CABLE THE SPARK OF QUALITY IS K/W EXPERIENCE

The spark of quality means positive—often dramatic—savings in service for those who will specify Kaiser wire and cable.

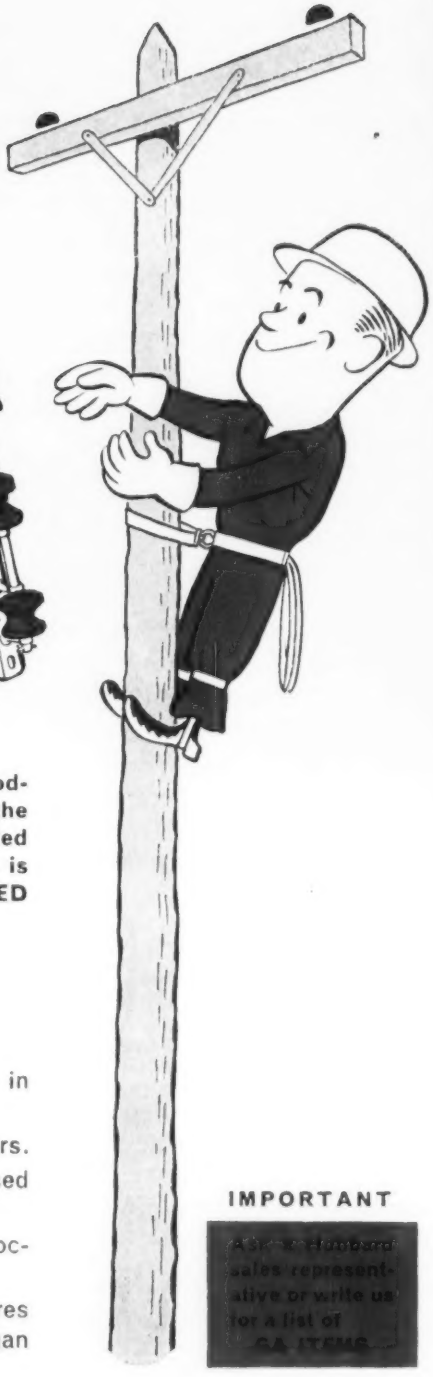
Among the world's leading electrical wire and cable producers, only Kaiser is heir to the 70-year experience of a major rubber company in developing insulation and jacketing compounds.

Insulations such as Laytex®, Laytex-Resin, Hydrosec® and Kalzone give greater utility, longer life to a complete range of aluminum or copper conductors. For immediate service in any type of wire or cable, call your K/W Distributor or Kaiser Aluminum & Chemical Sales, Inc., Kaiser Center, 300 Lakeside Drive Oakland 12, California.

KAISER ALUMINUM



GUARANTEED AVAILABILITY



Our long arms put a Hubbard product in the hands of the man on the pole so fast it seems as if we handed it out the factory window. This is what is provided by GUARANTEED AVAILABILITY.

Here's how we can GUARANTEE availability:

. . . Over 200 distributor warehouses bulging with stocks in 50 states.

. . . 4 Large Hubbard warehouses backing up our distributors.

. . . 4 Modernized Manufacturing Plants with vastly increased capacity for production.

. . . Short manufacturing cycle aided by electronic data processing of all paper—this replenishes stocks rapidly.

This new Hubbard Guaranteed Availability program insures the best service to the Utility Industry since Hubbard began serving it in the 19th century.

IMPORTANT

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ELKONITE® CONTACTS put the "extra" in circuit breaker service

To make sure that breakers in secondary distribution transformers will give the thorough dependability you expect, it pays to specify Elkonite contacts.

Elkonite materials are the result of *contact technology in depth*. Through Mallory-pioneered powder metallurgy techniques, they combine the heat resistance of refractory materials with the conductivity metals. Our engineers work with apparatus designers to select the exact qualities required for each application . . . hardness, mechanical strength, arc erosion resistance, and minimum heating. Then, in our manufacturing plant, advanced processing techniques control all phases of manufacture to assure adherence to rigid standards.

That's why there's a difference in Elkonite contacts. And there's a difference in the service you get from equipment that uses them. Don't settle for less.

From generator to user,
Mallory contacts serve the nation's utilities . . .

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for the latest data on ACSR

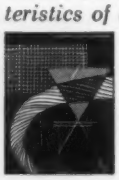
126 fact-filled pages...from Alcoa

It took more than 60 years to prepare these three publications.

Recently completed tests have made it possible to review and revise data accumulated since 1897, the year Alcoa launched a continuous research program on overhead aluminum conductors— *both all-aluminum and ACSR*. The most up-to-date information has been put into book form to help you in your job:

Design or operation of transmission lines is your problem. Maybe you're called on to predict the resistance and reactance of a proposed transmission line. Are available data good enough? This 90-page book supplies you with new information on resistance and reactance—information that can help you accurately evaluate the effects of the steel core on electrical characteristics. TITLE: *Resistance and reactance of aluminum conductors.*

How much heat loss can you expect from convection? Tough problem. One that's complicated by the chimney effect of a heated conductor. And varying wind conditions. This 20-page publication provides up-to-date information on heat dissipation caused by convection and radiation. TITLE: *Current-temperature characteristics of aluminum conductors.*



Electrical requirements on your system go up. You need to operate conductors at higher temperatures than in the past. You ask yourself: what about creep effect? Here's a 16-page booklet that provides easy-to-use answers to many questions on how aluminum conductors behave when subjected to various conditions of heating by high overload currents. TITLE: *Overload and fault current limitations of bare aluminum conductors.*

Ask any one of our representatives for your copy of these new publications. Written requests on company stationery should be mailed to Rome Cable Division of Alcoa, Dept. 1-70, Rome, New York.

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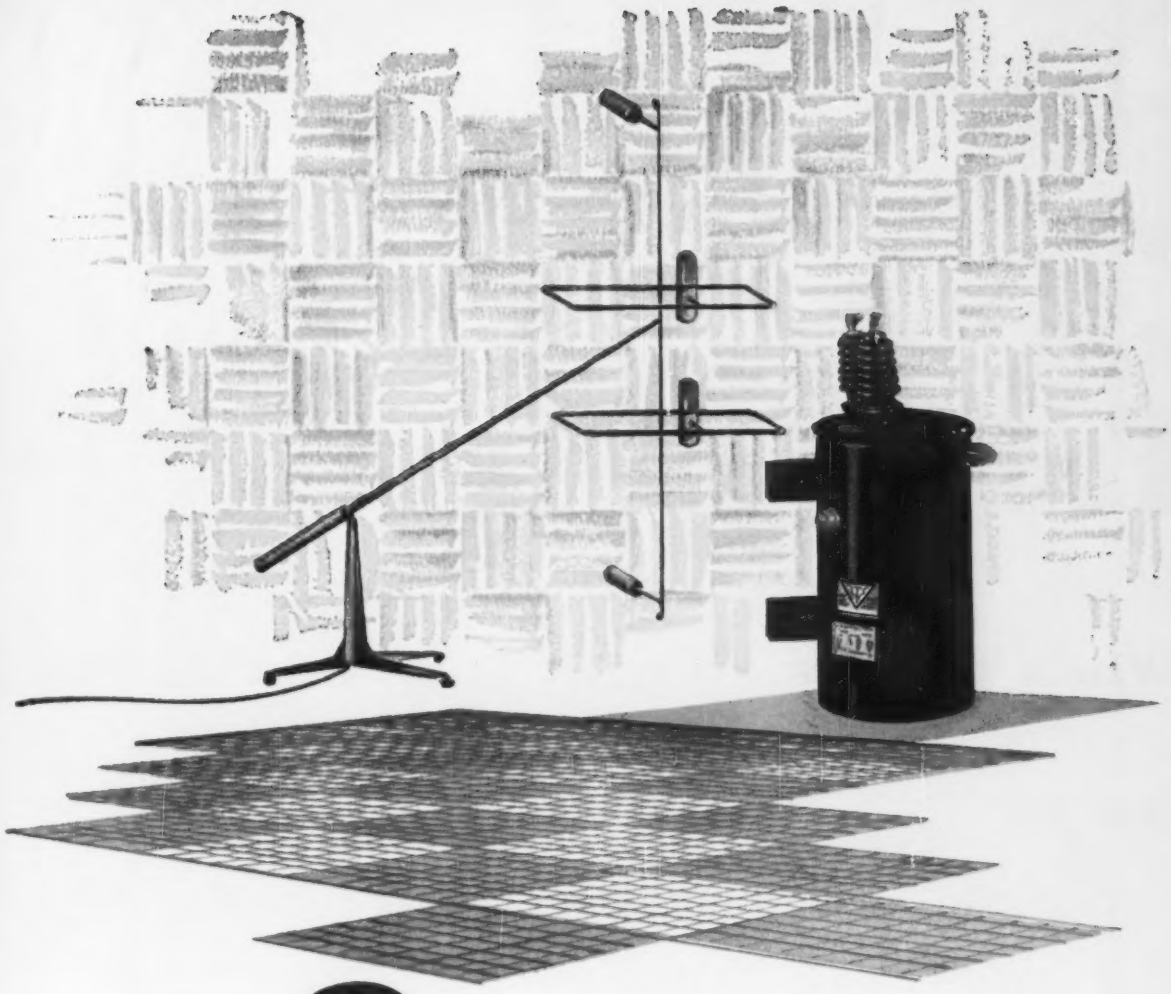

QUIET transformers assure satisfied customers. More-than-ordinary quietness is another outstanding feature of RT&E transformers. Normal noise is hushed, for full transformer life, by a unique core-clamping method that isolates the core and minimizes the transmission of sound vibration to the tank. By this method, operating noise is reduced to a point far below maximum db levels being considered by NEMA as standard for distribution transformers.

More proof that you buy more than just another transformer when you buy from RT&E.

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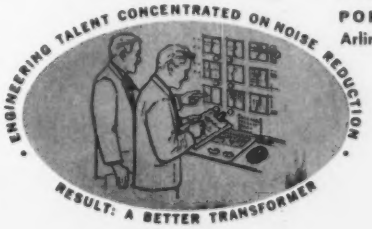

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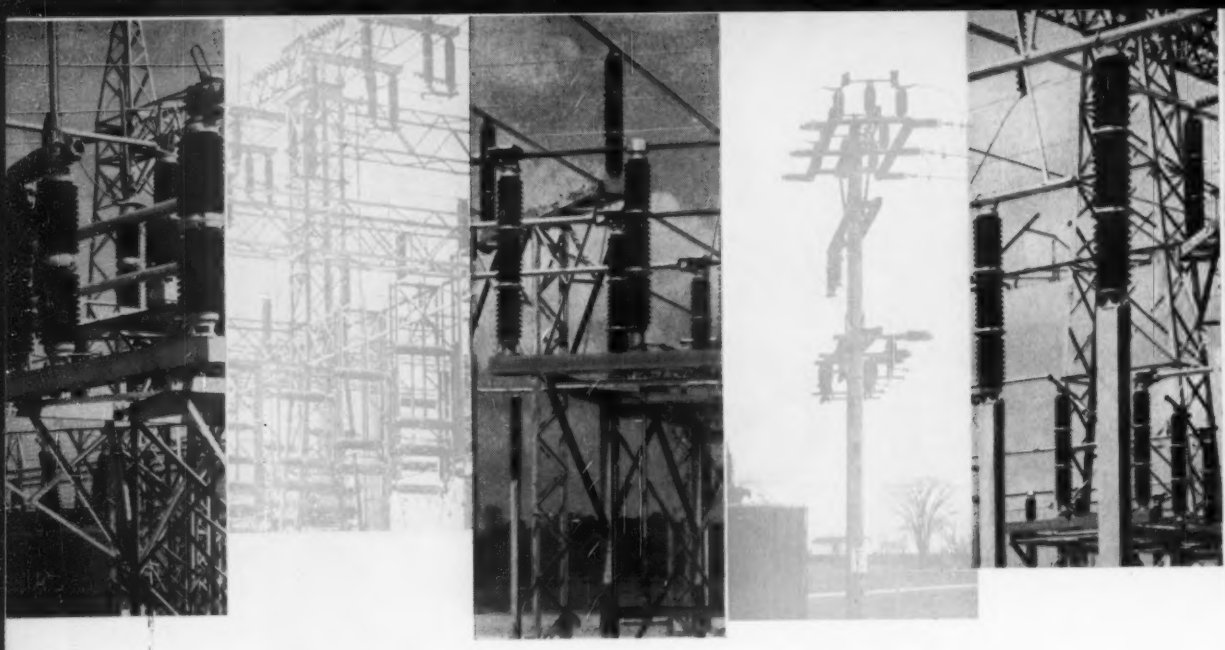
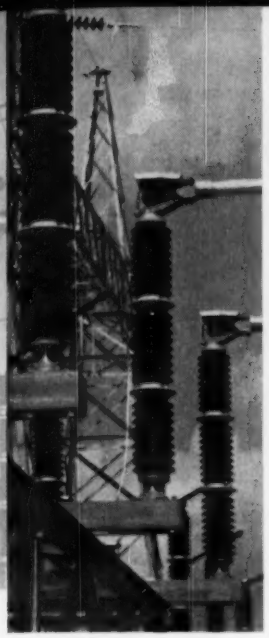
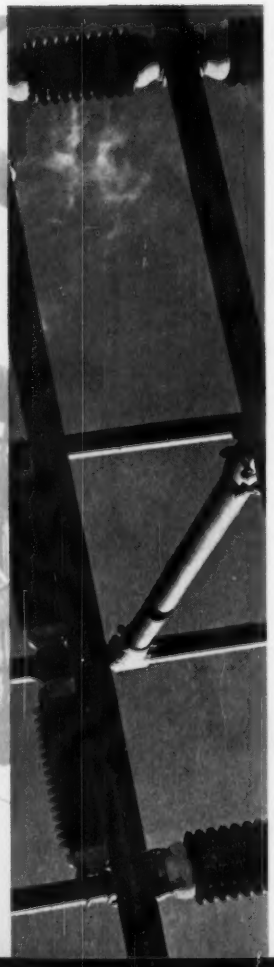


When you design with Lapp Station Posts....



Voltage Rating kv	BIL, kv	Cantilever Strengths, lbs.		
7.5	95	2,000	4,000	8,000
15	110	2,000	4,000	8,000
23	150	2,000	4,000	8,000
34.5	200	2,000	4,000	8,000
46	250	2,000	4,000	8,000
69	350	1,500	4,000	6,000
115	550	1,700	2,900	4,000
138	650	1,450	2,450	3,900
161	750	1,200	2,000	3,500
	900	910	1,450	2,750
	1050	750	1,170	2,300
	1300		1,000	2,000
	1470		900	1,750
	1640		770	1,550
	1800		680	1,400

.....you can have what you want in BIL, in strength, in stiffness



Use of Lapp Station Posts frees designers of modern substations from the need to design around characteristics—and shortcomings—of conventional switch and bus insulators.

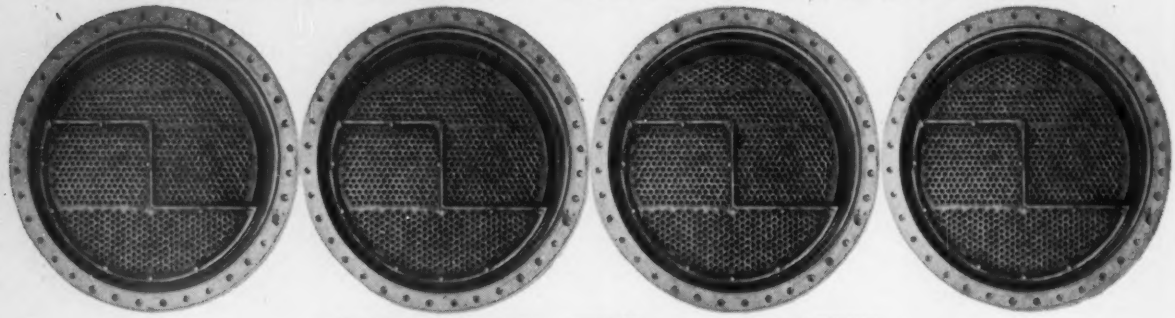
The family of Lapp Station Posts is a "modular series" which gives widest range of insulation levels *and* strength ratings. Station Posts are smaller in diameter, too . . . lighter in weight . . . stiffer . . . easier to assemble; and they're suited to mounting horizontally, underhung or angled . . . available in strengths greater than have ever been offered in conventional pin-cap units.

Stations on Lapp Station Posts require less real estate, less steel work. And, because their performance is better under all electrical conditions and mechanical loading, they need less maintenance too. You should have the whole story. You can read it in the new Lapp Catalog No. 8. If you haven't a copy, we'll be glad to send one.

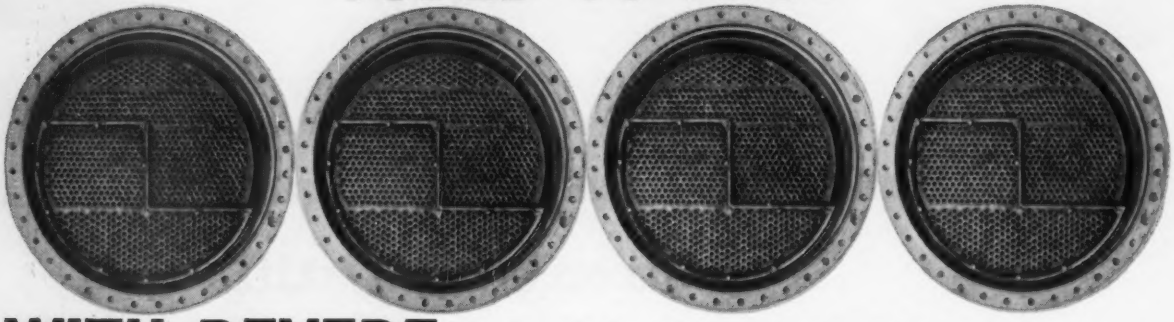
Lapp Insulator Co., Inc., LeRoy, N. Y.

Lapp

8 MORE FEED WATER HEATERS



"TUBED TO LAST"



WITH REVERE 70/30 Cupro-Nickel Tubes

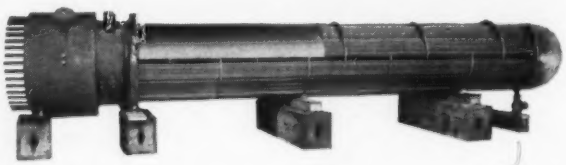
These Units for Cherokee Station Unit #2 of Public Service Company of Colorado were fabricated by YUBA Heat Transfer Division, YUBA Consolidated Industries, Inc., Honesdale, Pa.

Because there are so few sets of operating conditions that are exactly alike, each tube installation poses its specific problem which must be studied before a satisfactory recommendation can be made. In this installation of 8 feed water heaters, the specific set of conditions called for dual gauge tubes of 70/30 Cupro-Nickel. Tubes of dual gauge were used in order that uniform wall thickness be maintained after bends had been made.

This selection was made as a result of the collaboration of YUBA Engineers and Revere's Technical Advisory Service. It is this Revere Service, with its experience covering many and varied types of problems, that has been instrumental in prolonging tube life in power plants both large and small.

Why not take advantage of this storehouse of knowledge and contact Revere before making the final selection of tubes and plates for your equipment?

8 TUBE BUNDLES like this consumed 47,000 lbs. of Revere 70/30 Cupro-Nickel Dual Gauge Tubes.



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Founded by Paul Revere in 1801

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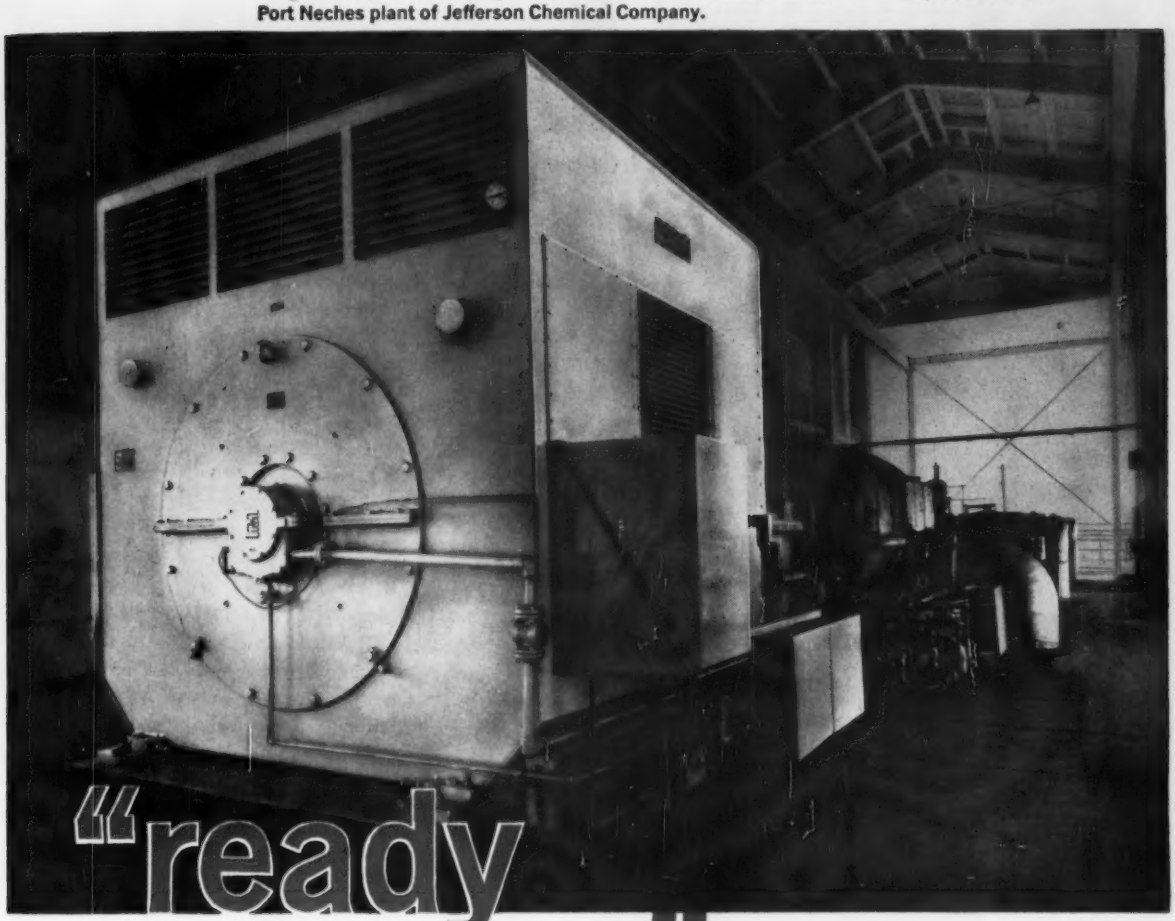
VERY PLEASED were user and contractor with the ease of installation and start-up of "Big Bertha," the 7000-hp Elliott motor shown below. It drives a compressor in the Port Neches plant of Jefferson Chemical Company.



"ready to run" when delivered

means easy, quick, economical installation

Elliott eliminates large motor "bugs" at the factory

A fundamental feature of Elliott motor manufacturing is to make certain that all motors are "clean" when shipped. Careful checks, tests and adjustments at the factory eliminate potential trouble-making "bugs" before shipment, making installation, start-up and early operation smooth and easy.

A good example is the 7000-hp Elliott motor shown above, dubbed "Big Bertha" by the operators. It went into operation very, very smoothly, which pleased both contractor and customer. And this is not an isolated case; the Elliott reputation for clean, bug-free motors is very well established. "You can bolt them down and start them up" is what our customers say of Elliott large motors.

Of course, "cleanliness" is only one manifestation of the high quality and perfection of every detail that is characteristic of all Elliott large motors. An interesting sidelight on this particular installation is that the motor was found to be carrying a load considerably in excess of guaranteed rating, without the slightest sign of distress

It is no wonder that experienced users say that the *very finest large motors built are built by Elliott.*

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THIS IS THE ONE, developed to meet your needs... THE SANGAMO SINGLEPHASE J3 WATTHOUR METER. This is the new and noteworthy development in watthour meters this year. One of the exceptional advances in metering in any year!

The moving system of the J3 is not supported or suspended. It floats, pure and simple, permanently and without friction, on a field created by magnets that are dimensionally and magnetically uniform. Stability is assured by the use of specially bonded Alnico in *all* magnetic components of the system.
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A CONTROLLED FLOATING SYSTEM for best performance on high loads. Side thrust is substantially reduced; tilt error is insignificant. These features combined with the unique slow speed of Sangamo J Meters, give you a moving system that is *guaranteed for life.*

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PLUS THESE TRADITIONAL SANGAMO ADVANTAGES: highest torque; slowest speed; lowest watt loss; sectionalized construction; corrosion-resistant finishes and materials; glaskyd base.

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JM60-4

SANGAMO ELECTRIC COMPANY / SPRINGFIELD, ILL.

Editorial Comment

JULY 11, 1960

Electric Cars Demand Utility Investment

An electric automobile is now in legitimate production. The manufacturer is soliciting power company orders, but only a small hard core are buying.

Herein may be the start of another chapter in the same tiresome story: a fine potential load delayed years in development or lost to a competitive fuel as the power companies remain apathetic. And here the load potential is fantastic, even if only for the station- and shopping-car market.

Considerable R&D is needed to achieve this potential. The present model is overpriced; in a Renault Dauphine body, it sells at about twice the Dauphine price, won't go much over 30, has a range limit around 45 miles, and has little "kick." Yet the electric is intriguing. Already its operating costs undercut the Dauphine, maintenance should be lower, it's quieter, exhaust- and vibration-free.

The designer promises reduced price on volume, but major price surgery and improved performance are needed to attract the desired public market. Key to acceptable performance is the battery, which must be improved drastically even while cost is being cut. Perhaps it's no wonder the utilities are yawning impolitely. But they are missing the basic issue.

The manufacturer is investing in a speculative enterprise, which he can pursue only to a point. With support, he can push development longer and harder, and persuade component builders to take him seriously.

Even at the present stage, utilities could use the cars for meter readers and other light transportation. By buying now, they would help drive down the price on volume, get valuable road experience, and gradually introduce the public to the idea.

But most important they would be *investing* in the evolution of more practical models, and thus performing an active and vital role in pushing this load toward a place in their growth picture.

Let's hope they get their heads out of the sand and stand behind this fantastic load builder. Where else can they get such good odds for only a $3,600 bet?

Cancer Is Everybody's Problem

Cancer runs second only to heart disease as the nation's prime killer. Some 100,000 valued members of the labor force will die of cancer each year. Statistically, over 500 of these will be electric utility company personnel.

The American Cancer Society says one-fourth could be saved by early detection. The regular check-up is the best insurance until the "cure" is found.

Despite these cold facts, there are only about 45 cancer detection centers operating in the US today. And barely a handful of industrial concerns have detection programs of any kind. Utilities have none.

But look at how little it would take to get going:

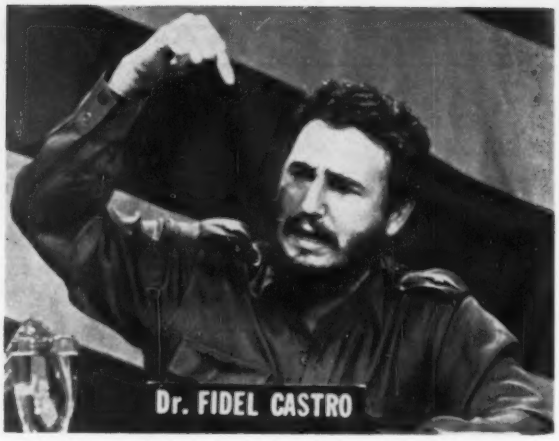
The ACS says the incremental cost of a detection program, providing a medical department exists, runs as little as $10 per examination. This includes part-time services of an internist, a gynecologist, and a secretary, plus supplies and equipment depreciation.

Added to this, for a utility, would be the lost time for the exam. But proper organization would hold this to a minimum. Added efficiencies could be had by banding with other local businesses.

Why not look into it? The first step is to contact the American Cancer Society, 521 W 57th St, New York 19, N. Y.

Maybe the electric utilities should show the way to other industries.

Castro Regime Poses New Danger To Cuban Electric


Dr. FIDEL CASTRO

Minister who threatened nationalization replaced as not aggressive enough. Fuel oil reported in tight supply

Further harassment and possible seizure of American & Foreign Power Co's $300-million Cuban subsidiary seemed in prospect following replacement of Castro Communications Minister Enrique Oltuski. Although Oltuski last month threatened nationalization within a few days or weeks if Cuban Electric did not resume its expansion program, informed sources reported that he was replaced because he was not aggressive enough in application of revolutionary policies. His successor, Raul Curbelo Morales, is a virtual unknown.

Oltuski last month contended that Cuban Electric was sabotaging the revolution by its failure to continue expansion—after the Castro government has summarily imposed rate cuts averaging 22%. He said the revolutionary government had been forced to spend $40 million annually for rural electrification.

In New York, H. W. Balgooyen, executive vice president of A&FP, reported that suspension of Cuban Electric's expansion program, which cost $190 million from 1950 to 1959, was a result of lack of capital. Since last year's rate cut, which ran as high as 32% in some classifications, Cuban Electric has not earned enough to service its debt, he continued. Cuban Electric has not paid any dividends since the second quarter of 1959, when the cuts became effective. The revolutionary government's rate-slashing edict also specified that expansion must be continued.

Balgooyen stated that Cuban Electric intends to continue to provide ample and reliable service as long as it can. He pointed out that expansion in the past ten years, which added 333,000 kw and boosted total capacity to 480,000, provided ample and even excess capacity for all customers served.

Although Oltuski contended that the revolutionary government had given Cuban Electric a 7% profit margin, which he compared to 4.5% to 5% in the United States, Balgooyen said A&FP estimated a return of only 3%, even after $90 million had been knocked out of the rate base by the Castro government. Questioned about the $40 million annual investment in rural electrification claimed by Castro, Balgooyen replied that A&FP had not even been able to contact Oltuski.

From 1950 to 1959, Cuban Electric ploughed back 67% of its income into expansion, according to the A&FP spokesman. He contended that the Cuban government, in making its study, had overestimated revenues, understated expenses, and assumed operating economies which were still in the future or unattainable. Although Castro was reported to be considering a loan of 10 million pesos (about $5.5 million on the free market) to Cuban Electric, it hasn't happened.

BALGOOYEN: 'Provides ample and reliable power as long as possible'

Cuban Electric is one of A&FP's two largest holdings. From 1950 to 1959, it provided one-third of A&FP's total income. The company furnishes 90% of the public supply for Cuba. Most of the remainder is seasonal load at sugar refineries, and is provided by on-site generation.

Approximately 85% of the common stock is owned by A&FP. The other 15% is held by private investors in the US and Cuba. However, because of heavy debt commitments, incurred to finance past expansion, A&FP's holdings represent only about 60% of the capitalization. About 10% of the capitalization is represented by a loan from the Export-Import Bank and by stock sold in the US. Another 30% is in bonds held by Cuban investors and banks.

A further complication for the Cuban utility was a report that oil is in very tight supply in Cuba. Cuban Electric's steam plants are all oil-fired. The majority of the other plants are diesel. American and European-owned refineries in Cuba were not paid for an estimated $50 million of oil refined for the government and refused to process oil for Castro because of standing commitments to their normal Venezuelan suppliers. In retaliation, the government seized the refineries.

Power Bills Await Extra Session of Congress

Senate-House conference to iron out public works appropriations. Rivers and harbors bill sent to President

Several major pieces of legislation affecting the electrical industry still face action by Congress this year when it returns to a special, politically super-charged session after the Democratic and Republican conventions are over.

The Public Works Appropriation Bill for fiscal 1961 is one of these—and one of the most susceptible to political maneuvering. Both the Senate and the House of Representatives have passed their versions of the Appropriation Bill, but a Senate-House conference, to iron out the differences, will await Congress' return.

Public Works Bill Boosted

The Senate version of the Public Works Appropriation Bill, just approved, calls for a total expenditure in the coming fiscal year of $4,030,-010,605—an increase of $115,211,-620 over the House version (EW, May 30, p 26). The Senate version also is about $160-million higher than the fiscal 1960 Appropriation Bill—vetoed by President Eisenhower twice last year.

The Senate version includes slightly larger appropriations for a great number of projects—few spectacular increases. Most power-related projects are identical in the Senate and House versions. The following exceptions give the Senate recommendation (House version in parenthesis): Barkley Dam, Ky., $17,100,000 ($3,300,000); Green Peter Reservoir, Ore., $2,000,000 ($1,400,000); McGree Bend Dam, Tex., $6,500,000 ($6,000,000); Lower Monumental Dam, Wash., $3,500,000 (nothing in House report); and three studies—Rampart Dam, Alaska, $350,000 ($100,000); Bruces Eddy, Ida., $600,000 (nothing); Carters Dam, Ga., $150,-000 (nothing).

The Senate and House versions are identical for Tennessee Valley Authority and Southeastern Power Authority; but the Senate recommended $29,570,000 for Bonneville Power Administration ($100,000 over the House version), $2,575,000 for Southwestern Power Administration ($50,000 over the House version), $2,675,960,000 for Atomic Energy Commission ($16.-9-million over the House version) —the latter increase mostly for plant construction and acquisition.

Other power-related measures scheduled to be decided in the August session are:

• Burns Creek project. The full House Interior Committee will discuss—and may approve—the federal hydro power project on the Snake River, Ida., sending it to the House floor. The Senate approved the authorization bill in 1959, and a House Interior Subcommittee approved the bill (S-2181) in late June (EW, July 4, p 34).

Downstream Bill Held Over

• "Downstream Benefits" or "Headwater Benefits" Bill (HR-7201) is due for debate on the House floor. It won't be put into law this year, however, because the Senate doesn't have a similar bill before it, and time is against full Senate consideration—from subcommittee through final floor vote. The bill would permit coordinated hydro power operations in river basins—and would require federal dams to pay FPC-determined "headwater benefit" charges to upstream reservoirs, as non-federal dams are now required to do.

No Action on Tax Deductions

• "Boggs Bill" to permit federal income tax deductions on most lobbying expenses. This measure also is ready for debate in the House, but won't get acted on by the Senate this year.

Congress had just sent to the White House its compromise version of the 1961 Omnibus Rivers and Harbors Authorization Bill, authorizing 130 new projects, estimated to cost about $1.5-billion. The authorization bill, however, doesn't include a provision, added by the Senate, calling for up to 10% of costs at federal multi-purpose projects to be allocated to recreational benefits. The House of Representatives wants to hold hearings on this provision before it is enacted into law.

Cable Faults Hit Downtown Cleveland

More than 300 Cleveland Electric Illuminating Co employees worked through the night June 29 to restore power to the downtown Cleveland area after five underground explosions caused by a fault in an underground circuit cut off power to nearby buildings, flipped up manhole covers and blew out plate glass windows.

Most of CEI's downtown customers had service by 10 am, 15½ hours after the blasts started in the Public Square area of Cleveland at 6:40 pm. The blasts were touched off when a fault developed in an underground dc circuit, part of CEI's distribution network that circles Public Square. The fault melted the lead jacket of the 220-v, dc cable, and caused the insulation under the jacket to smolder. Although lack of oxygen kept the insulation from burning, the heated mixture of gas and air exploded when it came in contact with fresh air coming from the street through manhole covers.

Five ac cables also run through the same vaults. Two of these were affected by the burning dc cable, making it necessary to shut off ac service, too. Preliminary estimates from CEI peg damage as high as $500,000.

The first flying manhole cover popped up right in front of the Illuminating Building—headquarters of the CEI.

There are actually four different electrical systems serving the downtown area, the dc system and three ac systems—one of low voltage (120/208 v), one 4,000 v, and one 11,000 v.

The 11,000-v system was unaffected. The other three systems were affected in varying degrees.

Energy Forum Turns Into Debate

Ellis and Radin turn first Energy Institute forum from industry problems to public-vs-private power conflict. Vennard cites broad public ownership of private utility stock

The private utility industry had to defend itself against a varied attack at the American University's Energy Institute in Washington, D. C., June 27-30. Most of the burden fell on Edwin Vennard, vice president of the Edison Electric Institute.

About 30 industry and government leaders from all energy sources —coal, oil, gas, nuclear and hydro power—were present, stressing their particular operational problems in competing both within and outside their own industries. The clash between public and private power supporters took place among general manager Clyde Ellis of the National Rural Electric Cooperative Assn, general manager Alex Radin of the American Public Power Assn, and Vennard.

The session had been planned as a seminar on the roles played by public, federal, private and rural power systems in the US. Instead, it turned into a series of comments on public and private power, similar to a recent session between Ellis and President Robert Person of Public Service Co of Colorado before the Democratic Advisory Council on Natural Resources (EW, June 20, p 85).

"One of the most fundamental characteristics of the electric industry," said Radin, "is that it is essentially a public business, irrespective of whether it is owned and operated by a public agency or a private agency."

Stepping away from this broad viewpoint, Radin devoted the rest of his comments to public power in its narrower meaning—as against private power.

"It is in its role as catalyst of energy resource utilization that I believe public power has made its most significant contribution to the electric industry," he said. "The public utilities have in most cases adopted low promotional rates which have encouraged high rates of consumption. High consumption in turn has made it possible to reduce unit costs, thereby making the lower rates economically feasible."

Radin also cited the Tennessee Valley Authority's low power rates per kwhr in contrast to the national average.

Vennard countered Radin's implication that private power companies were not "publicly owned." Not only stockholders have an ownership in private companies, he said, but even policy holders of insurance companies—which in turn invest in utilities—have an indirect ownership.

Vennard also attacked Radin's comparison of power rates. The reason public systems can sell it cheaper, he said, is because they don't pay federal income taxes, and —in the case of TVA—pay little or no interest on their capital debt.

"You and I, the American people, own TVA," Vennard said, "and if we want to put it under the Federal Power Commission for regulation, it is up to us to get Congress to do so." Vennard said a recent study of his showed that TVA gross revenues would have to be raised 46% to meet comparable costs of private power companies—this in turn would require higher power rates.

Ellis hit power companies' high salaries and "propaganda" programs as being figured into their rate bases. He added, "Competition, if there is any, in the electric utility industry results from the fact that municipal, federal wholesale and cooperative enterprises comprise part of the industry, and to that degree that these types of enterprise remain within the field—only to that degree will this competitive element remain."

Vennard said Radin's data on low TVA rates is filled with accounting errors. "No accountant worth his salt should have made them," Vennard added. He also cited the error of trying to compare system costs on the basis of kilowatt-hours.

In an afternoon session the same day, FPC General Counsel Willard Gatchell commented that he wished Radin had remained so that he (Gatchell) could ask why Radin was "so enthusiastic" about Russian power developments, and was less so on US development.

The Institute adjourned July 1, planning to return to the American University campus in 1961 with at least 75 participants. Dr Arthur Rayhawk, Institute director, told *Electrical World* that in future years —if the Institute grows large enough —committees and special groups will be set up to tackle and discuss specific problems. One such session might be an objective study of utility rates, finance and production costs by an experienced economist from outside the electrical industry, he noted. General reaction to the session was favorable, he reported.

One of the probable issues for future discussion—and possible Institute recommendation—would be a "Hoover Commission-type" body to study national energy and fuels policy and requirements. Resolutions in the Senate and House of Representatives—to set up a joint Congressional committee on energy —have been tabled by this Congress, and a quasi-governmental body could be a likely substitute for the Congressional committee.

Former FPC Commissioner William Connole, speaking at an evening session of the Institute, also recommended the creation of a national study group on energy needs.

According to Dr Arthur Rayhawk, director of the Energy Institute and staff member at American University, the idea for the Institute was conceived by a group of businessmen and Dean Nathan Bailey of the university's School of Business Administration. The stated purposes of the organization are to:

- Promote better understanding of past trends and develop a basic appreciation of major developments in production, distribution, and consumption of energy . . .
- Provide a clear understanding of the conflicts between various industry groups . . .
- Clarify and strengthen the role of private enterprise in the energy industries.

Civil Suits Mention Private Utilities

Latest antitrust indictments cite companies which may have bought equipment on allegedly rigged market. Philadelphia actions summarized as summer lull is expected

For the first time in the course of the extensive Philadelphia antitrust probe of the electrical manufacturing industry, names of specific private utilities have been mentioned in criminal and civil actions handed down by the grand juries. This occurred last week when steam-turbine-generator and condenser actions included a list of utilities that happened to be customers during an alleged rigged market situation.

The bulk of names appeared in appendixes attached to the companion civil complaints and serve as a minimum list of customers to which the defendants must mail a copy of the final civil judgment and new price lists, as sought in the civil prayer for relief. In previous civil actions, only public bodies were listed. The court will decide whether the prayer for relief will be granted.

The indictments on turbine-generators and condensers are reported to be the last that will be handed down until this fall. Of the four grand juries that have participated in the Philadelphia investigations, two have now been dismissed, the third has suspended its activities until September, and the fourth will continue its investigation through the summer months.

The first criminal trial is now scheduled for Sept. 19 at the Federal District Court in Philadelphia and will involve power switchgear assemblies. Length of trial is estimated by observers to be not over two weeks, regardless of the outcome. The second trial, on air and oil circuit breakers, has not been scheduled yet.

Up to now, a total of 18 indictments have been handed down, involving 27 companies, and naming 53 individuals. Maximum fines at stake total $8 million, including $2.65 million for individuals alone.

Utilities mentioned as having purchased equipment under the situations alleged in the indictments had little to say.

Commonwealth Edison Co, Chicago, pointed out that its contract with General Electric Co for the entire Dresden nuclear power plant package was signed July 10, 1955. The indictment charges the manufacturers with getting together in or about November, 1955, to arrange "position" on supplying turbine generators for Dresden, Indian Point station of Consolidated Edison, New York, and Enrico Fermi station of Detroit Edison Co.

Although Consolidated Edison refused to comment, its order for the Indian Point generating unit went on the Westinghouse books July 9, 1956. Detroit Edison told *Electrical World* that it had received the Allis-Chalmers proposal for Enrico Fermi on a bid basis on Nov. 8, 1955, though the actual purchase was made May 14, 1956.

In addition to agreeing who would have "position" with respect to bids on turbine-generators for the three nuclear power plants, the indictment charges that meetings were held in connection with bids for a turbine generator for Sikeston, Mo., and with bids made to TVA in 1957 for a 500-Mw unit.

The defendants are also charged with agreeing to raise prices on turbine-generators by 5% in July, 1957, and 3% in April, 1958. At a meeting held on Dec. 2, 1958, the indictment says, defendants and co-conspirators agreed that on sealed bids, the manufacturers would quote no lower than 3% off the published book price, and on transactions involving price negotiations, they would quote no lower than 5% off published book price.

Product groups involved in the indictments so far include: power switchgear assemblies; oil and air circuit breakers; low-voltage power circuit breakers; bushings; insulators; open fuse cutouts; lightning arresters; distribution, power, instrument, and network transformers; power switching equipment; navy and marine switchgear; isolated phase bus; low-voltage distribution equipment; industrial control equipment; steam turbine-generators; and steam condensers.

In the turbine-generator indictment, the following individuals were named as defendants: W. S. Ginn, vice president and general manager, GE Turbine Division; W. E. Saupe, general manager of GE's large steam turbine-generator department;

Utilities Mentioned in Latest Indictment

Turbine-Generators

US Engineers Corps; Black Hills P&L Co; Carolina P&L Co; Central Illinois Public Service Co; Consumers Power Co; Florida P&L Co; Houston Lighting & Power Co; Lea County Electrical Cooperative, Inc; and the following cities: Ames, Ia.; Burbank and Glendale, Calif.; Jacksonville, Fla.; Lafayette, La.; Los Angeles, Calif.; Muscatine, Iowa; and Sikeston, Mo.

Condensers

Argonne National Laboratories; US Navy; Central Illinois Electric & Gas Co; Central Louisiana Electric Co; Cincinnati Gas & Electric Co; Consumers Public Power District; Iowa-Illinois Gas & Electric Co; Monongahela Power Co; Pacific Gas & Electric Co; Philadelphia Electric Co; Southwestern Electric Power Co; Southern California Edison Co; Tampa Electric Co; University of Illinois; and the following cities: Grand Haven and Holland, Mich.; Kansas, Kan.; Lakeworth, Fla.; Orville, O.; San Antonio, Tex.; Vineland, N. J.; and Winnetka, Ill.

Turbine-Generators and Condensers

TVA; Commonwealth Edison Co; Consolidated Edison Co of N.Y., Inc; Detroit Edison Co; New England Power Co; Pioneer Rural Electric Cooperative; Union Electric Co; West Texas Utility Co; and the following cities: Celina, O.; Garland, Tex.; Hagerstown, Md.; Lakeland, Fla.; Springfield, Ill.; Stillwater, Okla.; Tallahassee, Fla.; and Webster City, Ia.

Civil Suits Mention Private Utilities (*Continued from page 55*)

W. C. Rowland, vice president, Westinghouse Electric Corp Steam Division; and C. I. Mauntel, sales manager, Westinghouse Steam Division.

Commenting on the latest indictments, GE reiterated its statement that company policy forbids its employees to participate in any restrictive trade practices. The statement then goes on to say that GE and other electrical manufacturers "have for many years been working with electric utilities to find ways to reduce costs by increasing the efficiency of prime electrical generating equipment." GE cites as an example "an average improvement of 10% in fuel consumption" during the past five years. This, GE says, represents a savings in fuel costs of "more than $200 million per year."

Individuals named as defendants in the condenser indictment are: H. G. Conkey, vice president, domestic sales, Ingersoll-Rand Co; M. H. Howard, manager of production, Foster Wheeler Corp; C. I. Mauntel, sales manager, steam division staff, Westinghouse; L. G. L. Thomas, president, C. H. Wheeler Mfg Co; and A M. Tullo, vice president, Worthington Corp.

Just prior to the turbine and condenser indictments a grand jury handed down an indictment involving manufacturers of low voltage distribution equipment. Named as defendants were Cutler-Hammer, Inc, Federal Pacific Electric Co, General Electric, I-T-E Circuit Breaker, Square D Co, and Westinghouse. Named as co-conspirators were General Switch Co Division of Norbute Corp, Murray Mfg Corp, Wadsworth Electric Mfg Co, Inc, and Zinsco Electric Products Inc. The indictment charges price fixing and says the defendants and co-conspirators do a total annual business of over $200,000,000 in these products and supply about 95% of the market.

All companies arraigned so far have pleaded innocent except Allis-Chalmers Mfg Co which pleaded guilty on all indictments in which it was named, and I-T-E Circuit Breaker Co which pleaded guilty on the power switchgear assemblies indictment. Of the individuals, only the Allis-Chalmers ones have entered guilty pleas.

New Business From Loan Fund Policy

The controversial policy of the Development Loan Fund—which makes loans on easy terms for long term development projects in underdeveloped countries—to require its funds to be spent for American goods and services, except under special circumstances, is beginning to generate more business for US firms under the foreign aid program.

The new policy was adopted last October to help reduce the deficit in the US balance of international payments by boosting exports. It also was hoped that it would encourage other industrial nations to finance more of their own exports to underdeveloped countries and hence to increase the total amount of economic assistance available. The policy shift was sharply criticized in many quarters as running counter to liberal US foreign trade policies. Prior to the shift, DLF followed a policy of permitting contracts under its loans to go to the lowest international bidder.

Roughly 75% of the approximately $450 million in DLF loans approved since the policy change has been earmarked for procurement of US goods and services. Before the new policy went into effect, it is estimated that approximately 50% of DLF's loans were allocated to buy foreign goods and services.

The percentage of loan funds to be spent in this country also will increase in the future. That's because plans for procurement in other countries already had been completed for a number of large projects being financed by DLF before the new policy went into effect. It was considered too costly and inequitable to force the cancellation of commitments already entered into by loan recipients.

Fewer Exemptions in Future

That was the case, for example, for five loans made to India since October for power projects totalling together some $66 million. India already had contracted to procure nearly $50-million worth of the electrical equipment and other goods and services needed for these projects outside the United States. A similar situation existed with respect to the Tariff irrigation and power project in Morocco for which the DLF loaned $23 million and with respect to a $22-million railway improvement loan to Pakistan.

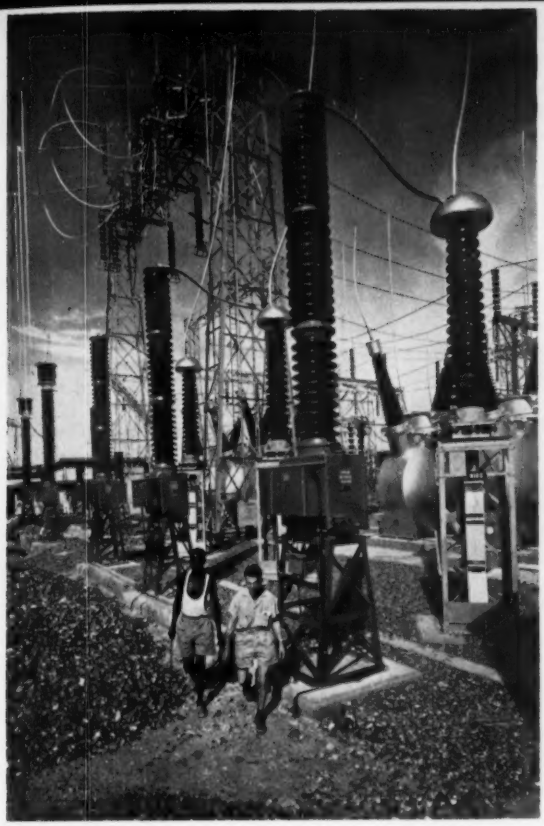
Future exemptions to the so-called "Buy American" policy of the DLF will be made more sparingly.

Although in general the new DLF policy seems to be making it easier for American firms to compete for the business generated by the Agency's loans, the effect is uneven from industry to industry.

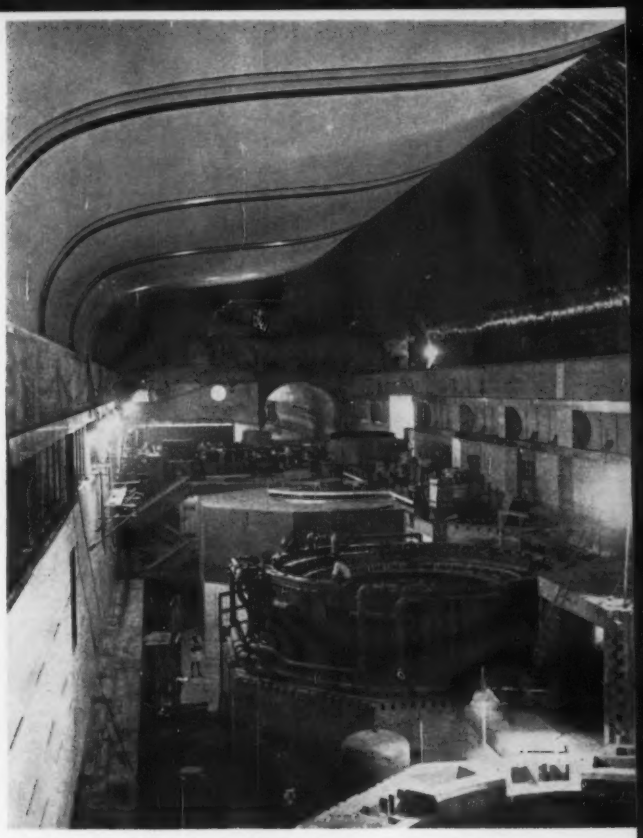
Thus, if India, say, finds that it can buy generators for a given power plant more cheaply in Germany than in the US, it won't necessarily switch its order to the US even though the DLF refuses to finance purchase of the German equipment. The Indian government may seek to persuade the German supplier, with or without German government assistance, to finance the sale of the German equipment and use proffered DLF funds to something else in the US.

In some cases, however, officials of the borrowing country have welcomed the DLF policy because it has given them justification for buying higher priced, but preferred, US equipment instead of less expensive foreign equipment.

DLF's rule of thumb in deciding whether to grant an exemption to the Buy American rule to a borrower is this: If the borrower cannot obtain foreign financing for a given purchase, DLF will insist on tying its loan to procurement in the US unless the cost of the project would be increased thereby so much as to make it uneconomical.



SUBSTATION BANK of three 240-Mva generator transformers step up voltage from 18 kv to 330 kv



UNDERGROUND TURBINE HALL has six British-built turbo-generators to provide 600 Mw in the first stage

Kariba Dam's First Stage Inaugurated

Work on the Kariba hydroelectric dam was suspended briefly in May when Her Majesty Queen Elizabeth the Queen Mother inaugurated the first stage of the project. But the noise of drills, voices, trucks, and hammers quickly refilled Kariba Gorge as soon as the ceremony was ended and workers had turned again to building the dam that will ultimately provide 8.5 billion kwhr per year.

The 420-ft-high concrete dam wall astride the Zambesi River, which forms the border between Northern and Southern Rhodesia, represents the drive to achieve a goal envisioned by British explorer David Livingstone: converting the Zambesi into a channel through which prosperity can reach deep into Africa.

The project's first stage, an underground power station, will have a capacity of 600 Mw. A bank of three 240-Mva transformers change the generation voltage from 18 kv to 330 kv for transmission to the system. At present, 78 Mw are produced by one generator. When the project is completed, six generators will produce the 600 Mw total.

2,000-Sq-Mile Lake Created

Workers have already created the world's largest man-made lake, which will ultimately stretch for about 175 miles from the dam toward Victoria Falls, with a surface area of 2,000 sq miles. The dam, an arch structure 1,900 ft long at the crest, will raise the water 350 ft above the dry season level of the Zambesi.

Before work could be started on the dam itself, a rail and roadway system had to be devised and a town had to be built on the heights of the gorge, to house the 60,000 people involved in the project. The town was constructed in 15 months, nearly eight ahead of schedule. It has schools, churches, recreational facilities, banks, courtrooms, administrative buildings, a $700,000 power station, and a hospital.

The British Commonwealth has provided 77% of the required money. Of the estimated $224 million needed for the first stage, $95.2 million was loaned by the Rhodesian Federal Government, $80.1 million was Britain's share of the World Bank loan, and the remainder came directly from Britain, through the Colonial Development Corp and the Commonwealth Finance Co.

The total value of contracts awarded during the preliminary stages of work is estimated at $156.3 million; the Federation and Britain shared in spending $114.3 million of this figure. British industry provided six turbine generator sets, high voltage switchgear, transformers, cables, and cranes.

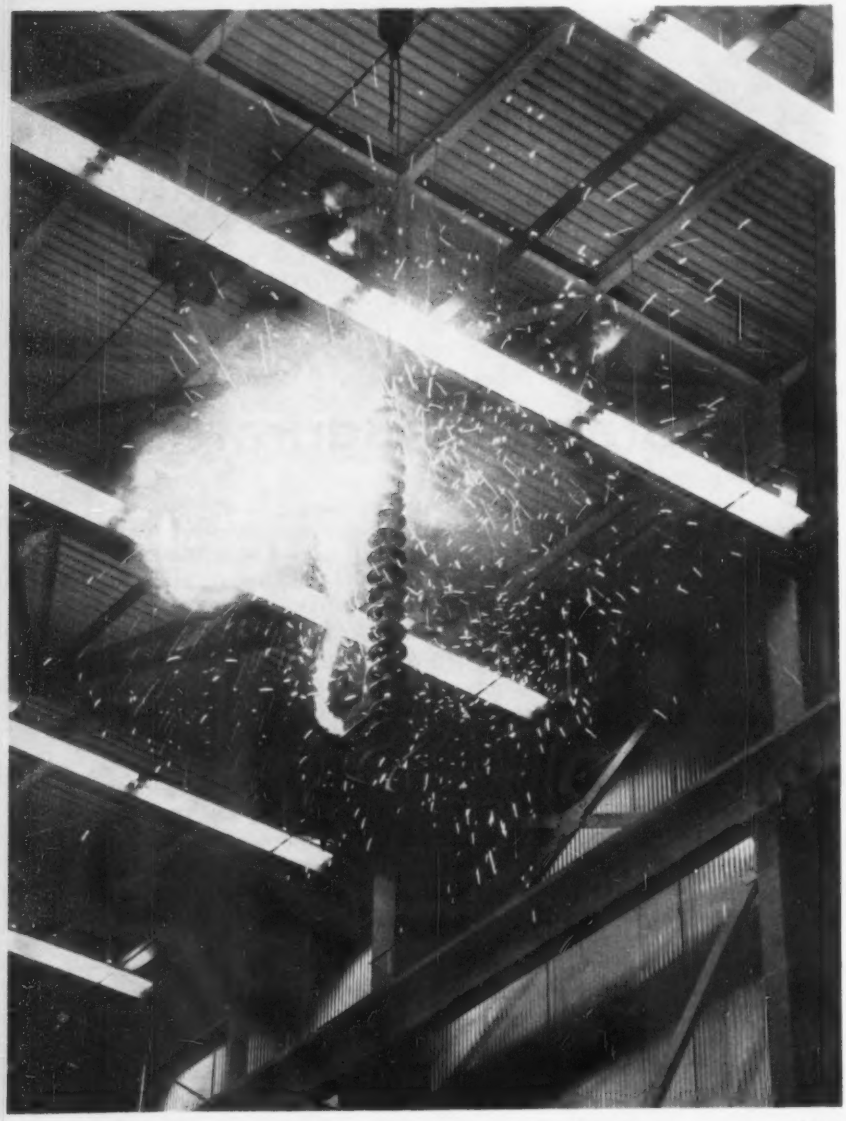
Lab Tests Simulate Lightning Arc

AEP-GE impulse tests seek data on lightning effects and on characteristics of EHV-system circuit breakers

Laboratory impulse tests, recently completed, successfully simulated the lightning effects on 345-kv-line insulators and circuit breakers for the first time.

The tests were made to extend present knowledge of the reclosing characteristics of extra-high-voltage transmission systems, even those at voltages higher than any in use today.

Preliminary test results point to a probable reduction in the dead-time requirement for successful line reclosure. They also corroborate field observation of such lightning-stroke effects as the burning and surface marking of an insulator.



ARC flashing from conductor at bottom into ionized gas cloud around insulator string is restrike occurring as breaker is reclosed after power arc extinction

Faster circuit-breaker reclosing on transmission lines, 345 kv and above, are intimated in the tests' time measurements of insulation recovery after breaker operation.

Engineers of General Electric Co and American Electric Power Corp, joint participating companies, are completing the analysis of the test data. The tests took place at GE's high-voltage switch-gear laboratory at Philadelphia. There were 150 individual tests.

A shorter dead-time after a power-fault interruption caused by lightning would improve system stability. By reducing the voltage fluctuation following a breaker reclosure, a shorter dead-time requirement would also help to stabilize power flow, thus permitting fuller use of equipment. Automated industries would be the principal beneficiaries of a constant voltage level, as their loads are becoming more and more sensitive to outage duration.

In the execution of the tests, three energy sources were employed. One was the laboratory's primary 60-cps power source at 38 kv.

The lightning source was the laboratory's impulse generator, rated 3,000 kv, and a 750-kv high-potential transformer provided the reclosing voltage.

18-Unit Strings Used

As a prelude to each test, the insulator string was energized with 38 kv from the laboratory's power generating source.

When the 10,000-amp impulse flashed over the string for several hundred microseconds, predetermined currents from the 38-kv power source resulted. These currents ranged from 5,000 to 27,000 amp. They simulated the normal 345-kv power-follow arc.

During most tests, the conductor was supported by an 18-unit insulator string similar to those on AEP's 345-kv transmission lines.

The power arc, like natural lightning, created an ionized gas cloud during its 4-cycle burning and surrounded the insulator string with various arc products.

The glowing clouds, showing plainly in both accompanying pho-

Effects on 345-Kv Transmission

tographs, are composed of the ionized particles. In both instances, during separate tests, the clouds of particles produced paths which were followed by restrike arcs.

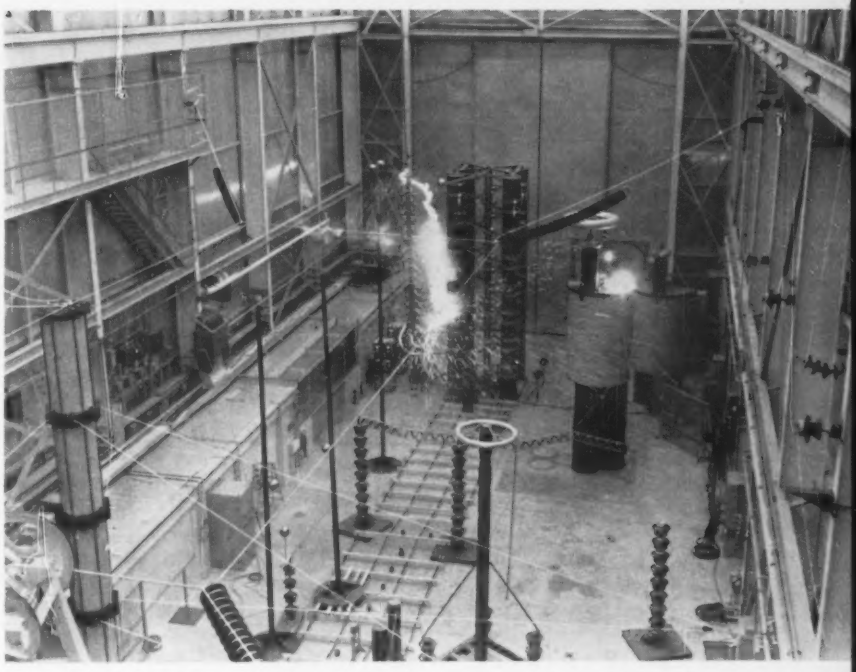
An air blast power circuit breaker interrupted the arc 4 cycles after each test's initiation. Dead time following the interruption was varied from test to test, from 25 down to 5 cycles.

With the closing of a second breaker, a linearly rising voltage from the high-potential transformer, which was capable of cresting in a few microseconds, was applied to the string. In this way, the system reclosing transient was simulated.

The latter voltage was of a magnitude sufficient to assure breakdown in each test. These breakdown points were recorded on each occasion, this information being a principal objective for the conduct of the tests.

The test results were interpreted in terms of dead time required for a given reclosing transient.

Statistical distribution of the results was assured by running a sufficient number of tests.



RESTRIKE resulting from reclosure after 18-Ma power arc followed impulse shot over string. Column at left is surge reactor; 1,050-kv transformer is at rear

Many Factors Studied

The many factors influencing reclosing success were studied in this test program. The factors included fault arc duration, the polarity of reclosing voltage, the number of insulator units used, and the effect of circuit breaker resistor follow current.

Information was sought especially on how deionization time of impulse-initiated faults compared with the time of fuse-wire-initiated faults. On all these factors measurements were taken and recorded.

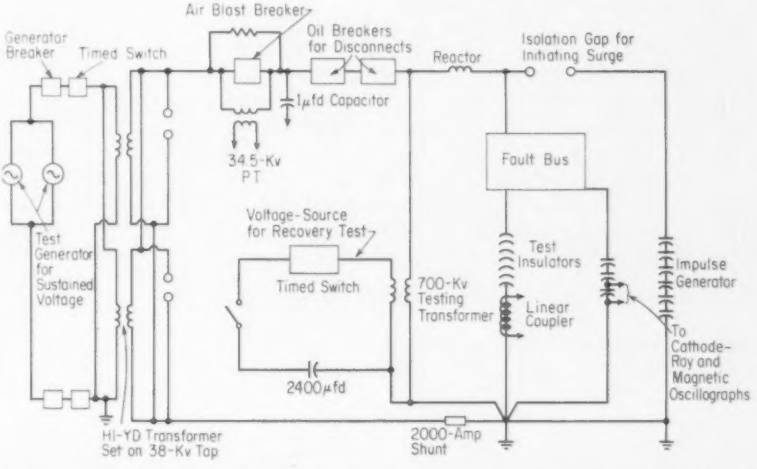
Conditions Controlled

As all critical test facilities were indoors, test conditions were carefully controlled, and the tests' severity was maximized.

Because the magnetic and thermal effects of increased currents were difficult to isolate, the test engineers minimized the magnetic forces. This they did by making large loops and using symmetrical feed in the test bay.

This elimination of the magnetic forces furnished a test situation in which a fault could be represented as being fed equally from both directions. It was also representative of a conductor passing through a portal-type tower.

Some insulations did not fail even though they were subjected to as many as 36 impulse tests. This exposure, according to AEP engineers, represented a great deal more punishment than any string would be likely to undergo in actual field service.



SCHEMATIC shows test equipment arrangement. Dacron rope from simulated transmission line permitted inspection teams to lower fault-bus assembly quickly

New Airport Distribution 34.5-Kv Ur

Multi-million-dollar, 250-acre Los Angeles terminal will have 26,750 kva of transformer capacity so served

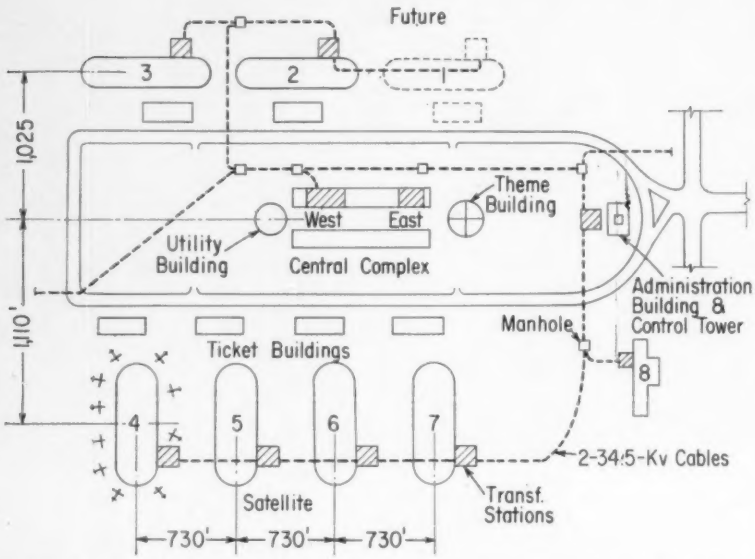
W. SHERWOOD, Electrical Engineering Associate, Los Angeles Department of Water & Power, Los Angeles, Calif.

A 34.5-kv underground distribution system has been selected for the multi-million-dollar air terminal now under construction by the City of Los Angeles, Calif. It will serve the 26,750 kva of original transformer capacity in strategically located stations and latter additional capacity.

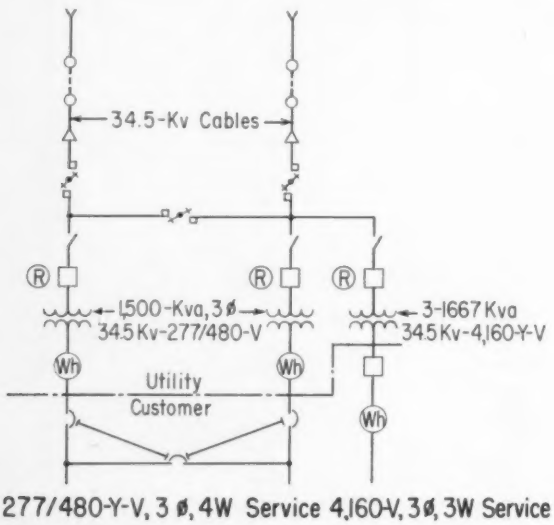
Determining electrical loads and maximum demands for transformer sizing and the most reliable and economical service presented the Department of Water & Power with considerable difficulty.

For the terminal's facilities for handling 23 million air passengers per year in 1970 are spread over 250 acres and consist of a central complex, eight passenger terminals —called satellites—seven ticket office buildings, and the administration building with its control tower. Moreover, the airlines had to develop operating techniques for handling jet planes.

One large airline will occupy Satellite 7 and the smaller Satellite 8. Each of the other satellites will

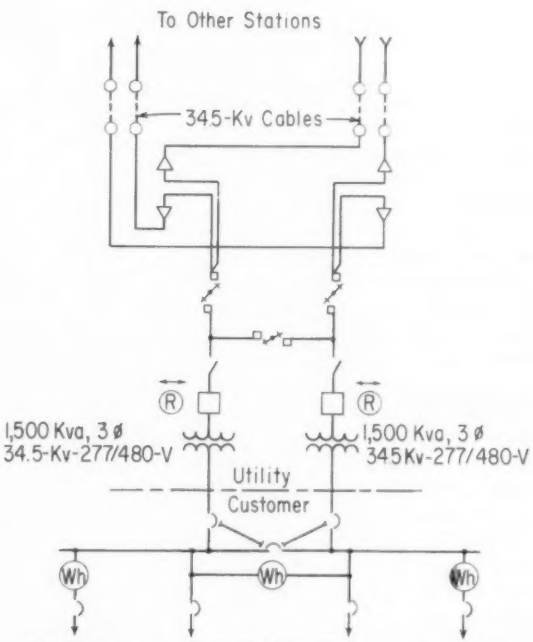


PLOT of the new airport under construction shows disposition of airport building, the transformer stations, and cable runs in 34.5-kv underground system



277/480-Y-V, 3 ø, 4W Service 4,160-V, 3ø, 3W Service

ONE-LINE DIAGRAM of the west transformer station shows station's complexity. It has two 1,500-kva transformers



277/480-Y-V, 3 ø, 4 W Service

TRANSFORMER STATION serving airline satellite is shown schematically. Each satellite will house ten airplanes

LOS ANGELES INTERNATIONAL AIRPORT, under construction, will have 172-ft control tower surmounting administration building and the airport's entrance

be occupied by one airline, except two which will be shared by the smaller domestic and foreign airline companies. Each satellite is designed for a maximum of ten planes, although the airlines themselves vary in their estimates of how many planes will be served at one time.

Plane ground power requirements for lighting, air conditioning, and other facilities will be supplied from 400-cps m-g sets in sizes from 60 to 140 kva. Demand factors estimated by airlines for ground power load ranged from 60 to 100%. Power and lighting requirements for the ticket buildings and satellites included passenger bridges, conveyors, and tube blowers. With the close cooperation of all concerned, the average maximum demand for a satellite and its associated ticket building was estimated at about 2,000 kva.

Each satellite, except Satellite 8, will be served by an adjacent 34.5-kv 277/480-v underground station consisting of two 1,500-kva 3-phase transformers. Satellite 8 will have two 750-kva units. The load will be divided and balanced so that each transformer will have a demand of 60 to 70% of its capacity. Each ticket office building will be served by a 277/480-v feeder from its associated satellite building. The Department of Airports will provide two 3,000-amp busways from the transformer room to the main service stations.

Each transformer will be fed by one of two 34.5-kv underground lead-covered, paper-insulated, gas-filled three-conductor cables. Load interrupter switches will be installed in the line and at bus-tie positions. These will allow switching under load for maintenance or emergency without interrupting service.

The Department of Airports will provide two 480-v main service switches and an interlocked tie breaker with automatic transfer operation. If a transformer or a cable should fail, the load will be transferred automatically to the other unit. Tie breaker operation or a transformer overload will actuate an alarm at a control panel in the complex area to alert airport maintenance personnel. Upon notification of trouble, Department of Water & Power personnel will open the line switch. If only the cable has failed, service would be restored to both transformers by closing the 34.5-kv bus-tie switch.

The central complex west transformer station will have a 5,000 kva, 34.5-4.16-kv bank of single-phase transformers for the air-conditioning compressors in the utility building. The station will also have two 1,500-kva, 34.5-kv-277/480 v, 3-phase transformers for pumps and fans, general lighting, and miscellaneous power. Low-voltage loads will be balanced, and the automatic transfer arrangement will be provided. The air compressor load is the only one that will not be transferred in a transformer or cable failure.

Buildings Have M-g Sets

The central complex east transformer station will have only one 1,500-kva, 3-phase transformer for power to the service and maintenance building and the so-called Theme Structure. This building consists of an observation deck and a "sky high" restaurant. An operating mechanism will be made available to airport personnel for switching 34.5-kv cables in a cable failure. The Department of Airports will install small m-g sets in each building for emergency service. These stations will be equipped with a gas-pressure relay for operating an alarm at the control panel when gas pressure is lost in the 34.5-kv cable system.

The administration building and control used by the Federal Aviation Agency and the Department of Airports will be served by an underground station. This will be 75 ft away because of structural reasons and difficulty in providing for equipment access. It will be equipped with three 250-kva, 34.5 kv-277/480-v wye-connected transformers and provision will be made for cable transfer by airport personnel. The station was originally designed for a 3-phase transformer but was redesigned for single-phase units because of early completion requirement. Fuel storage and pumping equipment, remote from the terminal facilities, will be served from smaller transformer stations.

Use of 3-phase transformers reduces the size of the underground stations, an innovation for the department insofar as industrial loads are concerned. Equipment access will be through a hatchway in the ceiling of an area adjacent to the transformer room. Personnel will enter from the adjacent switchgear room. Transformer rooms will have thermostatically controlled blowers to provide ventilation. The Department of Airports will provide two 3,000-amp busways from the transformer room to the main service sections.

The two transformer stations in the complex area, being in surface enclosures, will be cooled by convection. Wall and ceiling openings will be large enough for increased future capacity. The heights of these stations required that their floors be depressed below the surrounding elevation, which will necessitate construction of covered trenches outside to allow passage of equipment. The bottom of the trenches will be at the same level as the transformer room floors, so that transformers and oil circuit breakers can be lowered and moved inside.

F. L. LAWTON (l) and Dr G. A. Gaherty, both of Canada, talk with Great Britain's Sir Christopher Hinton

EHV TRANSMISSION SESSIONS were attended by (l to r) Charles Condordia, I. B. Johnson, P.A. Abetti, all GE

DAN BRAYMER IN EUROPE—V

World Power Talks

Madrid conference, attended by many from US, hears coal surplus, pipelines shape Continent's power generation

Madrid, Spain — World Power Conference speakers here saw European power patterns, including the apportionment of power production among thermal, nuclear, and hydroelectrical generation, shaped by present coal surpluses and the prospect of low-cost oil and gas via pipelines from Africa and the Near East.

These latter factors tempered optimism over the early introduction of nuclear plants into power-short areas. Yet talks on the long-term promises of nuclear power dominated the program of this 13th Sectional Meeting, and the subject was widely discussed among the delegates.

Present were delegates from Soviet Bloc countries, including Yugoslavia, Czechoslovakia, Hungary, and Poland. The five-man USSR group participated in technical discussions but otherwise remained aloof. Friction over Chinese membership was acknowledged only in a note in official reports that the matter had been tabled, and no Chinese was present.

Long-distance gas and oil pipelines, already beginning to criss-cross the Continent, are effecting basic modifications in Europe's power economy, said Dr E. H. Kost, German National Committee head.

One consequence, he said, is that energy problems can no longer be defined by national borders and are becoming international. As energy sources increase in different areas, prompting amplification of local machine efficiencies, the consequences of an error of judgment can be more widespread and serious, he declared. This situation, he added, must be considered in developing high-cost installations for exigencies still 10 to 20 years ahead.

Oil Brings Optimism

The insecurity prevalent in 1958 among countries of the Organization of European Economic Cooperation (OEEC) over the lag between production and use has evaporated, said Georges T. Combet, French National Committee head. Recent oil discoveries in Africa, he noted, have had an invigorating effect, and OEEC gas and nuclear energy goals for 1960 have been surpassed.

Nevertheless, Combet advised caution with regard to proposals for large-scale integration of nuclear power stations into present electrical systems, and other conference speakers shared his apprehensions.

Sir Christopher Hinton, head of Britain's Central Electricity Board, declared: "It is heartening to find competing systems being more thoughtfully evaluated, not as a matter of national prestige, but on the basis of industrial merit."

The last seven years have taught management that the economics of nuclear fuel must be estimated in every country and local district in terms of conditions that can affect demand for the cost of every available power source, Hinton continued. He added that, despite the tempering of early optimism, nuclear power still holds the long-term promise of effective and economical supplement to world power sources.

Hinton warned that fuel-fabrication and reprocessing plants in the first decade of Britain's program required many times the expenditure for reactor design.

Dr Frank K. Pittman, director of reactor development for the US Atomic Energy Commission, saw these prospects for nuclear energy in his own country:

1. Little change in the cost of energy over that in conventional plants in view of stable fuel costs and metallurgical barriers to higher steam temperature.

2. Nuclear energy becoming competitive on a wider scale within 20 years and by 1968 in high-fuel-cost areas in units of 300 Mw.

3. Likelihood that water reactors and organic-cooled-and-moderated reactors would become economic soon and other types later.

Pittman emphasized the impracticability of fitting any one reactor concept into all circumstances.

CLOSED-CIRCUIT RADIO enables delegates at this hydro power session to understand the speaker. Whichever language is spoken, simultaneous German, French, and English translations allow conferee to participate

Stress Fossil Fuels' Role in Europe

Thus, two conclusions can be drawn from the nuclear sessions:

1. Because fossil fuels are more available than was foreseen, the immediate need for nuclear energy is not likely to be felt.

2. Experience in the main nuclear programs has paved the way for promising reactors and achievement of competitive power in high-fuel-cost areas by 1970.

Discussing commercially practicable reactors in the US, W. L. Cisler, Detroit Edison president, said that in 5 to 10 years nuclear stations will be built under more favorable technical and economic conditions.

Experience with Enrico Fermi plant, he said, suggests that breeder reactors in 300-Mw sizes will be competitive by 1968. Utilization factors of 75% for nuclear plants are optimistic, he said, adding that 65% would be more realistic.

Two French papers discussed nuclear progress. M. B. Leo and M. L. Maillard said that two of the three Marcoul experimental gas-cooled natural uranium reactors, G-2 and G-3, are supplying 25 to 30 Mw to the transmission system of Electricité de France. The G-1 Marcoul reactor did not produce the energy it consumed, but nuclear fuel can be charged into and discharged from the more recent G-2 and G-3 reactors without stopping operation, a condition that provides high utilization factors and continuity of plutonium and energy production.

C. Leduc, French Atomic Energy Commission, and J. P. Roux, Electricité de France, said that the French nuclear program provides for 850 Mw by 1966 in four stations designated for capacities of 60 to 300/400 Mw. It is planned to increase unit capacities by 4 every four years, they said, citing the schedule for four French stations, as follows: EDF-1, 60 Mw, 1960; EDF-2, 170 Mw, 1961; EDF-3, 250/320 Mw, 1964; EDF-4, 300/400 Mw, 1966.

Gives Reactor Timetable

Jean Andriot, French Atomic Energy Commission, said that for the short term gas-cooled, graphite reactors will be the first to produce competitive power in France. For the middle period, heavy-water-moderated natural-uranium carbon-dioxide-cooled units will become competitive. Construction of a prototype of the latter was started this year, he said. For the long term, however, breeder reactors hold the most promise, and an experimental reactor of this type, called Rapisodia, of 5 to 10 tMw, will go into construction this year.

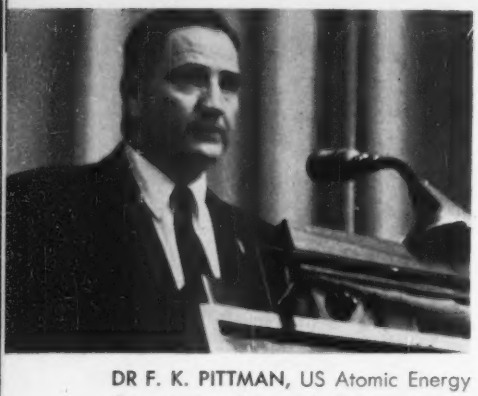
England's Sir Christopher Hinton, in a paper with Brown and Rotham of the Central Electricity Generating Board, said that at high load factors, the cost of energy from nuclear and conventional plants in the UK will be equal some time between 1965 and 1970. In the years immediately ahead they saw the average cost of coal in the UK increasing slowly from about 37 to 42 cents per million Btu, leaving the economy of conventional plants dependent upon age and utilization factor. Thus by 1966 they felt that a nuclear plant with 75% load factor could break even at 0.53 cents per kwhr with conventional plant, and by 1970 for 60% load factor at 0.55 cent per kwhr.

With the introduction of nuclear power, system operators face the task of readjusting running schedules to yield service to nuclear systems even if it means an energy surplus. Dr. Marguerre, Germany, suggested that to compensate for the load reduction at the expense of conventional stations, heat storage units be built for conventional and nuclear plants at $40 per kw. By combining heat storage with fossil superheaters in nuclear plants, it would be possible, he said, to reduce costs below conventional plants'.

C. C. Whelchel, Pacific Gas & Electric Co, said that nuclear stations will be competitive when they are base loaded and their installation made where thermal power is needed but fuel is expensive. As the proportion of nuclear power increases, nuclear installations must diminish their capacity factor.

Theumissen, Holland, compared nuclear with hybrid stations in which three-quarters of the heat is reactor-generated, a quarter by fossil superheat. Nuclear power cost

F. L. ADAMS, US Federal Power Commission, headed American delegates



DR F. K. PITTMAN, US Atomic Energy Commission, discussed reactor gains

K. E. HAPGOOD reported on 460-kv line which TVA is readying for test

PHILIP SPORN, AEP president, spoke to session on conventional fuels

was taken at $300 per kw and $350 per kw in two variations. He showed that nuclear power can't compete with conventional power at $350 per kw, and that for the same investment a hybrid station can only compete for load factors over 70% in high-fuel-cost areas. At $300 per kw hybrid stations are competitive with load factors of 50%. He suggested that the relation of hybrid nuclear stations to total capacity should range from 0.4 to 0.5 when fossil fuel cost exceeds 50¢ per million Btu. Below 65¢ per million Btu hybrid nuclear and conventional plants are cheaper than nuclear and conventional plants.

Philip Sporn, American Electric Power Co, observed that until nuclear capacity is at least 30% of total power, nuclear load factors must exceed 75%. As production of energy is an economic problem, he said, the means will be chosen for economy.

Study Higher Steam Conditions

Successively higher steam conditions up to the supercritical, bigger unit sizes, intermediate reheating and up to nine stages of preheating were trends discussed as contributing to improved turbine cycles. It was reported that 26 turbines for steam temperatures of 1,100F or higher were in use or were being built as of September, 1958. They included 11 back-pressure machines and 15 condensing units of which 11 are in the US, three in Germany, and one in Belgium. Users of the first European 1,100F condensing installations reported that after the first two or three years high-temperature stations give no more trouble than 1,000F stations. The first European unit was for 4,250-psi, 1,100/1,050/1,050F and has been in service at Huls since 1956.

While admitting that such steam conditions call for expensive materials whose use has given rise to difficulties due to expansion coefficients and high stresses in piping and at joints of ferritic materials, C. Wilwertz, Belgium, said these difficulties have been overcome. Progress in development of high-alloy steels and efforts to reduce prices will determine whether these high pressures will be adopted.

In Britain emphasis is on bigger generating units rather than on increasing steam conditions. E. S. Booth and J. W. H. Dore, CEGB, said that doubling the size of units results in a saving of 20% in cost per kw installed; that an increase of 35C in initial steam temperature and in reheat bring a 1¾% improvement in efficiency, and that a 100% increase in size with unchanged steam conditions brings a 1% improvement in thermal efficiency. Thus, they said, a 330-Mw unit would show 1% better thermal efficiency and 6% lower cost per kw than a 275-Mw unit under identical steam conditions, 2,300 psi, 1,050/1,050F.

Today the British system with 27,000 Mw installed and heavily interconnected favors big units. But highways are restricting single components to 160 metric tons. Largest units in operation are 350 Mw, but a rating of 550 Mw was attained by cross-compounding 275-Mw units. Accent is on improved cooling to increase output for a given weight of stator core and windings.

Boiler design has not affected unit sizes in Britain so far, it was stated, but size of combustion chambers is being held down until more is learned about mixing large quantities of pulverized coal and air.

In the US overall installation costs of thermal stations have increased more than 200% in the last 30 years. But thermal efficiency has increased 57.5% and fuel cost only 26%, while fuel prices climbed 120%, Philip Sporn and F. N. Fiala, AEP, showed.

AEP Units Cited

This year will see two 450-Mw units designed for 3,500 psi, 1,050/1,050/1,050F in operation at AEP's Breed and Philip Sporn plants. Sporn and Fiala said that improved efficiency through higher steam conditions must await a breakthrough in metallurgy. Moderately priced materials for 1,100 to 1,250F service are badly needed.

Sporn said that he was glad to see interest growing in Belgian steam temperatures above 1,100F, but warned it would be a mistake to conclude that the US is pushing ahead with units of this temperature. Temperatures of 1,150 to 1,200F pioneered at Philo No. 6 and Eddystone plants of AEP and Philadelphia Electric Co, respectively, have not been followed in subsequent installations for eco-

SAN JUAN Y PICARDAS SYSTEM'S hydroelectric facilities were visited by delegates to the 13th Sectional Meeting of World Power Conference at Madrid, Spain

nomic rather than technical reasons. Although costs of high temperature piping can be cut, Sporn said, the boiler is where the major economic burden is encountered at temperatures above 1,050F. Sporn warned users of austenitic steels against over-optimism because of early trouble-free operation, and suggested that his company's next 450-Mw unit might not use temperatures much above 1,000F.

Study of the economics of specialized peaking units on a hypothetical system in the US shows that prices between 6 and 12% peaking capacity can be justified. The paper, by J. K. Dillard, Westinghouse Electric Corp, showed that the more peaking energy required, the lower must be the peaking unit's first cost to be economical. High growth rates favor base load units, the paper continued, but peaking units should be provided for growths of 10%. Since they displace efficient units and increase overall production costs, they are most attractive in low-fuel-cost areas, he said.

Staye and Larson, Sweden, attacked the problem of when it pays to start up steam stations in predominantly hydro systems. They have developed a basic rule curve that indicates, for any moment of the year within the dry period, what reservoir capacity will insure minimum water consumption required (to minimize fuel consumption) during the rest of the dry period.

Hydro Discussed

Four Ontario Hydro engineers described the economic dispatch of mixed hydro and steam systems. They showed that, in short-range economic dispatch, optimum coordination is attained when marginal costs of energy produced by different stations are equal. For long-range dispatch, procedure is by trial stages to find the best passage from one reservoir capacity to another in a given period, using water level values that average those tried out.

Another group of papers examined the attractive possibilities of pump-storage hydro where thermal plants are the basic source of power. A paper from Poland (Jackowski, Koban, and Laski) suggested that pump storage fits in well where maximum use must be made of level rivers and there is no possibility of establishing annual regulation reservoirs. Meir, Switzerland, noted that economy of nuclear plant operation suggests not only continuous full-load operation, but avoidance of sudden load variations.

A German paper by Uitting, Haager, and Preza, said that pump storage is usually economic when cost per kw does not exceed 1.3 to 1.4 times that of a thermal station.

Choice between reversible pump-turbine units and pump turbines with adjustable blades is a controversial subject. The Poles concluded that reversible machines have obvious advantages when only a small head is available, as in the Rance scheme in France. For greater differences of head (10 to 150 meters) oblique flow pump turbines with adjustable blades, like those at Sir Adam Beck Plant No. 2, in Canada are more suitable.

A German paper reported that 380-kv transmission attained the requisite efficiency. The problem now, it said, is to define the economic advantages. Some countries, the paper noted, are considering 600 to 700-kv transmission, and 500-kv is in use.

Pierre Ailleret, France, said that a choice of steps for transmission voltage increases is necessary to avoid confusion that could hamper interconnection of bulk-power systems. He urged a single level.

E. Henning, of Sweden, cautioned against having too many voltages. Another should not be picked, he said, until a big step can be selected.

P. A. Abetti and I. B. Johnson, General Electric Co, showed that trends in relative cost of line and terminal apparatus make higher US transmission voltages advantageous when loading capabilities can be fully realized. In the next decade, 460 to 500-kv can be anticipated, they said, and dc overhead transmission is a possibility although it remains an unattractive alternative to EHV economically and technically and cannot compete with ac over less than 350 miles.

Ailleret, France, said that dc is more justifiable when transmission goes submarine. He suggested that if Sahara gas were not to be transported through Spain or Italy by pipeline it would be possible to build power stations in North Africa to burn the gas and transmit energy by dc cable to Sicily or Cartagena, Spain, over distances too short to suffer competition from ships.

K. E. Hapgood, Tennessee Valley Authority, said the agency's 7½-mile, 460-kv test line will operate at 161-kv this year. It will employ a triple-bundle of conductors on 18 in. centers suspended from 24 5¾ x 10-in. insulators on 37-ft spacing.

Forecasting Is Topic

Most authors of papers dealing with energy forecasting, preferred to base it on customer data and production records. In some cases, particularly for short and medium-term forecasts, exponential extrapolation gave good results. Contributing to these conclusions were papers from the US, Great Britain, France, Germany, and Japan. The authors emphasized the wisdom of using alternate methods simultaneously as a cross check.

Says UK Keeps Pushing A-Power

Lord Chandos tells Bournemouth convention new nuclear plants are closing in on conventional production costs

J. H. M. SYKES, Overseas Correspondent, Electrical World, London, England

Great Britain's nuclear power program continues to advance toward its goals despite economic, financial, and political obstacles, the 12th British Electrical Power Convention was told recently at Bournemouth, England.

"The Central Electricity Generating Board, facing a large surplus of coal and under the political pressure such a surplus entails, nevertheless has held to the course of its long-term program of nuclear power stations," Lord Chandos, convention president, told some 2,000 delegates. He is also chairman of Associated Electrical Industries.

"We must congratulate ourselves," he continued, "that the Authority has not been diverted by today's unfavorable conditions. In my view the newest nuclear power stations, after allowing for the amortization of capital, would produce energy at cost equal to a conventional power station's if the latter bought coal at as much as $11.2 per ton. Thermal power stations at the pithead now buy coal at $9.1 a ton."

Noting that the economic gap between nuclear and conventional power production is about $2.1 per ton of coal at the pithead, Lord Chandos said of the former: "Striking improvements have already been made in the capital cost, and more are to come. It is my estimate that the capital cost of the new stations will, before long, be below $280 per unit of capacity installed."

The Generating Board's policy, he said, aims at keeping Great Britain in the forefront of the development of this source of energy; at supplementing the nation's sources of power during the next 20 years; and, at bringing the cost of this supplementary power soon to less than the cost of power derived from domestic coal or imported oil.

The capabilities of generator units increased throughout the 1950's and seem likely to continue doing so, said C. R. King, Electricity Council chairman.

"Only about ten years ago the 60-Mw unit was regarded as standard size for generating stations in this country," he said. "Within the next four years, however, the High Marnham Station 200-Mw set will yield pride of place to the 275-Mw sets at Blyth 'B,' the 200-Mw sets at West Thurrock, and the cross-compound units of 550 Mw, each virtually equivalent to two 275-Mw units, at Thorpe Marsh.

"The 350-Mw sets for installation at the Drakelow 'C' and Blyth 'B' stations," he said, "are the largest single-shaft units yet designed in this country."

Power Costs Halved

Compared with other commodities, electricity today costs the British consumer about half what it did before the war, said H. G. Nelson, managing director, English Electric Co, Ltd. Much of this cost reduction, he said, was achieved through the development of large generating units which grew fourfold in ten years.

Noting that 350-Mw single-shaft sets on order are expected to be running in 1964, Nelson declared: "Taking all factors into consideration and assuming advances in techniques, but no revolutionary discoveries, the possibility might be envisioned of cross-compound, double-shaft sets of 2,000-Mw coming into operation during the 1970's."

Turning to exports, Nelson said that the changing pattern of international trade has considerable effect on British manufacturing.

"A primary feature of overseas business," he said, "is competition from American, Japanese, Continental, and Soviet-bloc equipment, sometimes locally manufactured."

Nelson explained that price competition, now particularly severe, prompts some British manufacturers to develop alternative, more economic designs for equipment for overseas. These designs, he said, sometimes commend themselves to home customers also, but in other instances the British will have to strive to establish new specifications acceptable both at home and abroad.

"The electrical manufacturing industry," he said, "is still based on its United Kingdom factories, its overseas works being important but secondary adjuncts. Nevertheless the situation can be foreseen where orders taken by the parent companies in one territory are executed in whole or in part by factories in another territory. Thus in years to come there will be a greater tendency toward a world-wide network of factories operated as a system, works being allocated according to complex problems in politics, economies, and expediency."

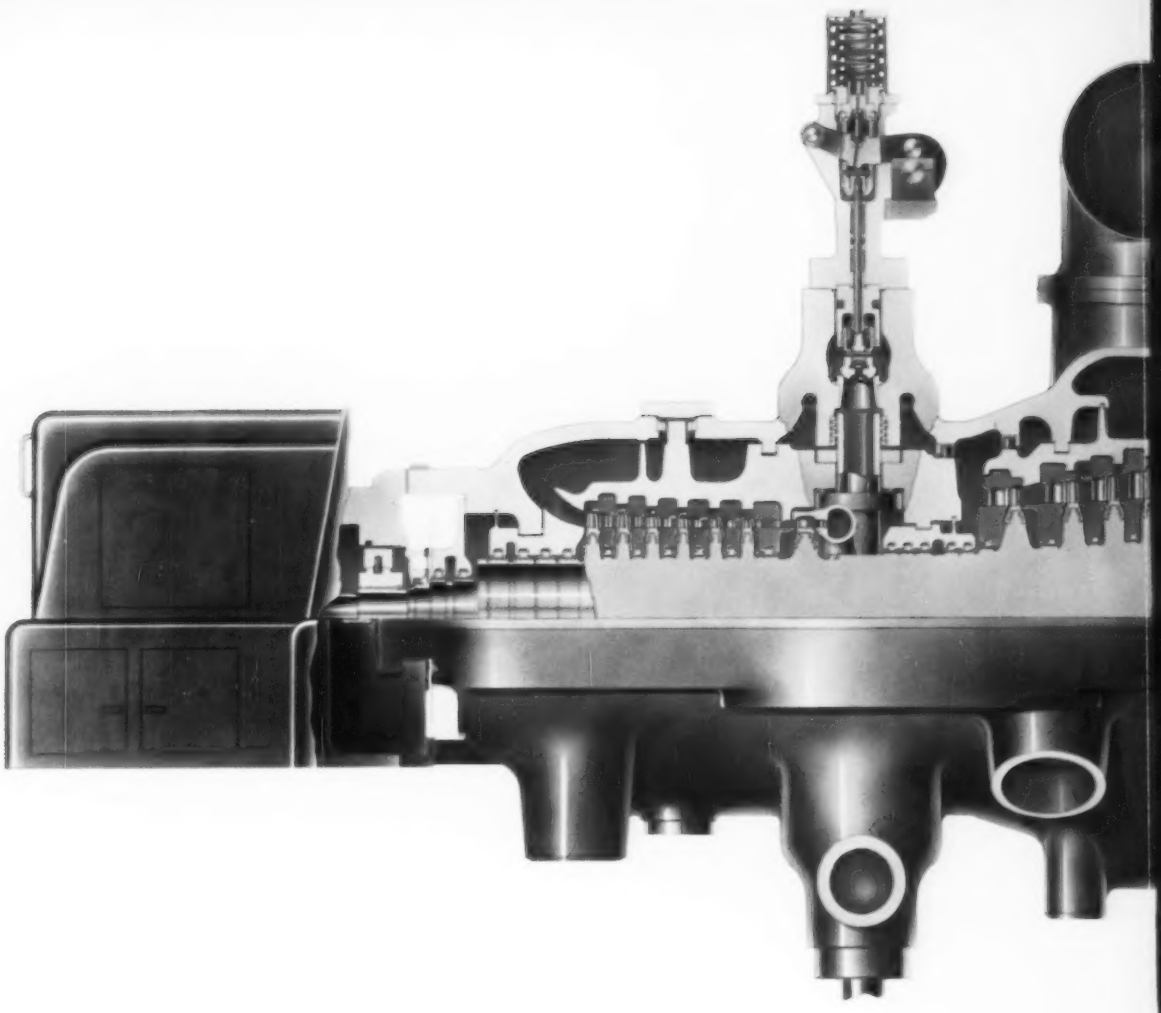
Tariff levels, and labor, material, and transport costs, he said, are among the determinants of factory location. He noted that goods made in the US today often incorporate components made in subsidiary factories on the Continent or in Japan and shipped to the US because this procedure shows a cost advantage.

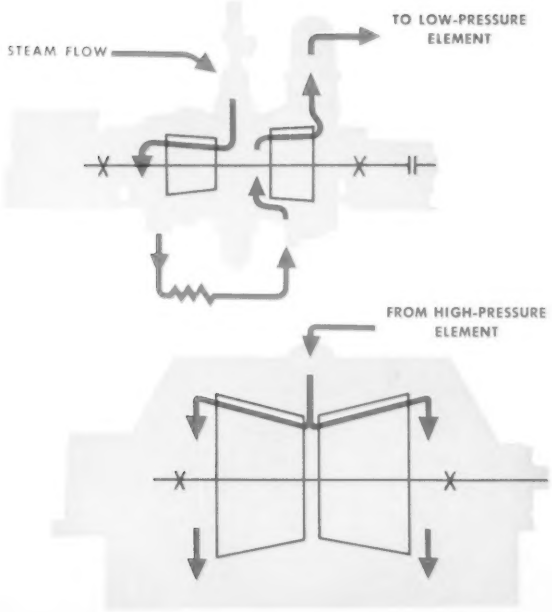
Providing very long-term credits to overseas purchasers of capital goods strains the financial resources of UK manufacturers, said E. V. Small, chairman of BEAMA Export Panel. It has put these manufacturers virtually in the brokerage business and left them dependent on government to take over the bulk of the liability, he added.

"No manufacturer can find capital in addition to his own financial requirements to support credit operations of this kind, and borrowing from banks demands security beyond his capabilities," the speaker declared.

"Many firms, while matching technical skill and manufacturing ability against all comers, find themselves bogged down and floundering in money problems beyond their competence. Consequently, they often fall out of the export race."

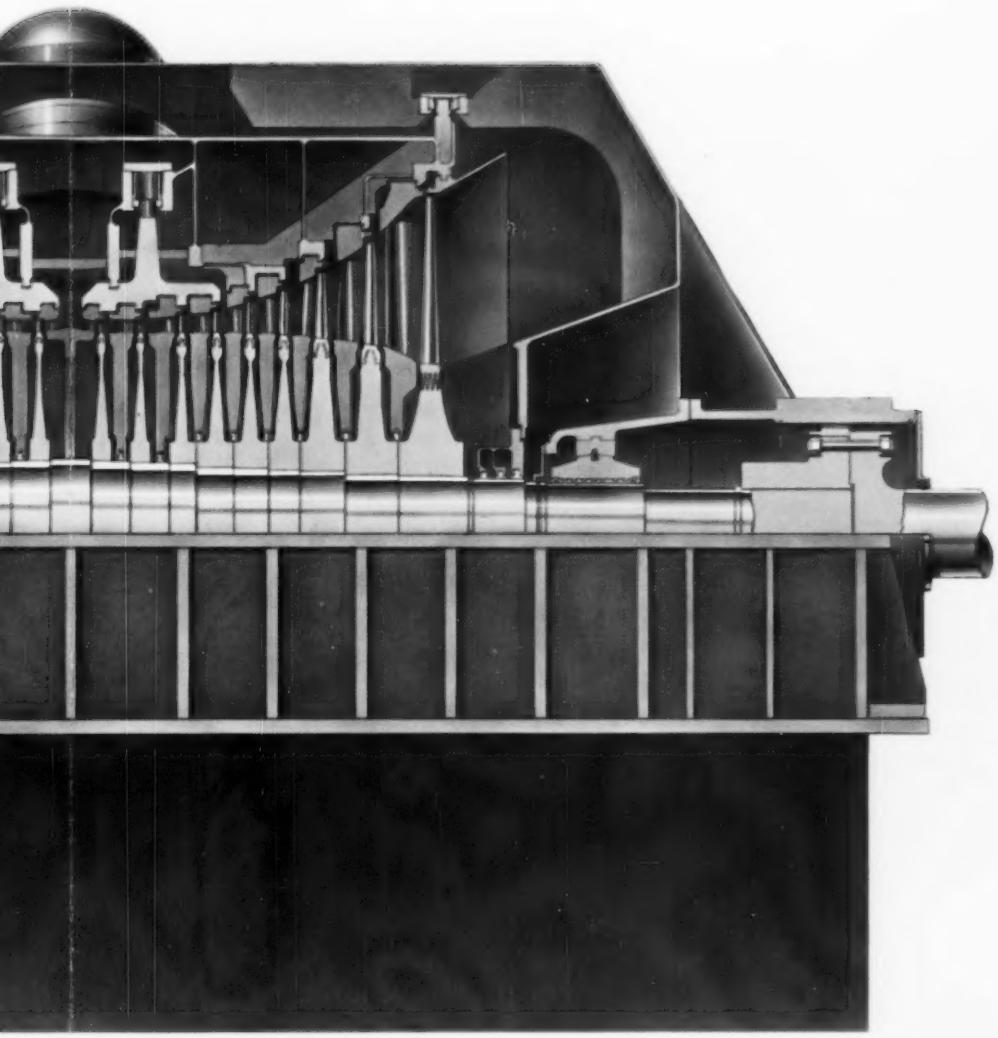
British utilities are hard pressed to find more transmission routes for 295-kv, soon to be 380-kv and probably 500-kv, towers in the crowded, built-up island. This situation was much discussed from the convention floor.



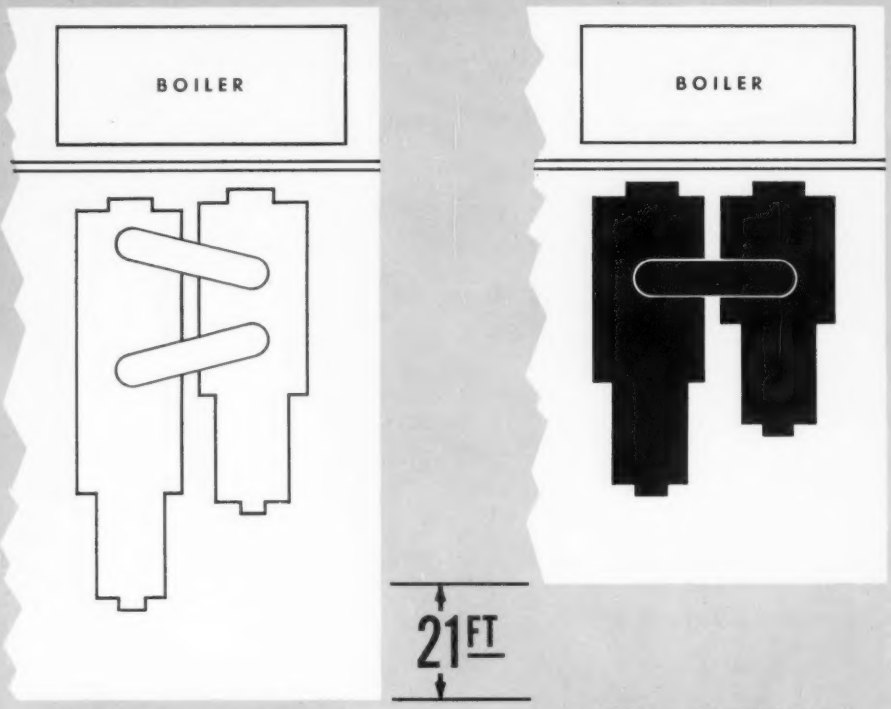

STEAM FLOW
TO LOW-PRESSURE ELEMENT
FROM HIGH-PRESSURE ELEMENT

3600/1800-rpm, cross-compound,
double-flow, reheat steam turbine

GENERAL ELECTRIC



LOWER INITIAL PLANT COSTS
WITH MORE COMPACT TURBINE-GENERATORS



Here's Why General Electric's New Cross-Compound, Double-Flow Steam Turbine Is The Most Compact Power-Generation Package

General Electric's new cross-compound, double-flow turbine can provide more kilowatts per square foot of floor space than any other turbine—with a resulting savings in installation costs. It is now actually possible to install 400,000 kilowatts of capacity in a space previously required for only 150,000 kilowatts. Because of the short, matched lengths of both shafts of this cross-compound turbine, the unit is particularly suited to plant expansions.

Installation cost savings can result from:

- reduced size of building expansion—for instance, short turbine may leave area for lay-down space
- utilization of existing crane span, and
- much smaller foundation requirements.

Inspection and maintenance time are reduced with this turbine because the whole unit is in only two casings—and the entire unit can be inspected and maintained by removing only two shells. This two-casing design is possible because General Electric's unique high-pressure/intermediate-pressure sections are combined into one casing. Also, two single-flow, low-pressure sections have been combined into a single span on the 1800-rpm shaft to eliminate a low-pressure element. This extreme simplicity means fewer shells, rotors, bearings, packings, and other parts—further reasons why the new General Electric cross-compound, double-flow turbine can save you installation and maintenance costs.

GENERAL ELECTRIC

General Electric turbine design engineers: J. E. Downs and H. Hegetschweiler

NOW BEING BUILT
FOR DUKE POWER COMPANY

First Pre-Engineered Cross-Compound, Double-Flow, Reheat Steam Turbine, With New Compact, Two-Casing Design

One of General Electric's new pre-engineered steam turbines can be adapted to fit your specific station and load requirements. Among the various pre-engineered turbines already being built is the 3600-/1800-rpm, cross-compound, double-flow, reheat steam turbine. The first installation of this design will be at the Allen plant of Duke Power Company.

This compact turbine, featuring an extremely simplified design—with only two casings—is now available in ratings up to 400,000 kw. The new design retains the inherent qualities of General Electric large steam turbine-generators and also considerably lowers installation and maintenance costs over previous similar designs.

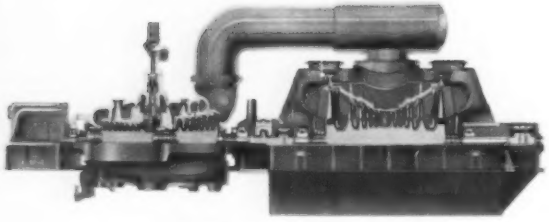
You can take advantage of these savings by using General Electric pre-engineered large steam turbine-generators. For more information, contact your G-E Apparatus Sales Office. General Electric Company, Schenectady, New York. 244-82

GENERAL ELECTRIC

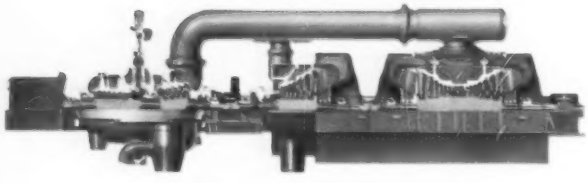
Profitable Power from General Electric Turbine-Generators

General Electric Pre-Engineered Steam Turbines

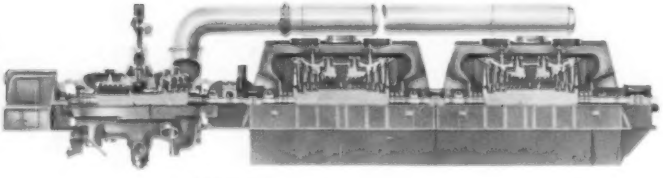
THAT CAN BE ADAPTED TO YOUR SPECIFIC LOAD REQUIREMENTS



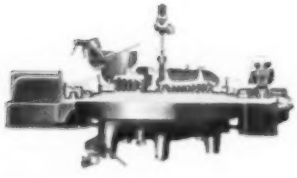
3600-rpm, tandem-compound, double-flow, reheat steam turbine

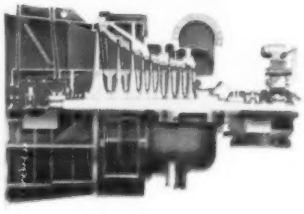


3600-rpm, tandem-compound, triple-flow, reheat steam turbine

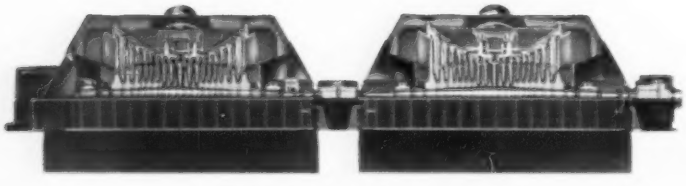


3600-rpm, tandem-compound, four-flow, reheat steam turbine

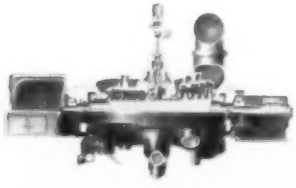


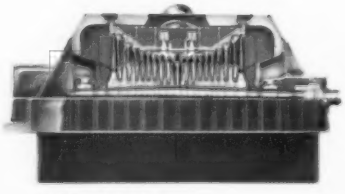


3600/1800-rpm, cross-compound, single-flow, reheat steam turbine



3600/1800-rpm, cross-compound, four-flow, reheat steam turbine





3600/1800-rpm, cross-compound, double-flow, reheat steam turbine

Progress Is Our Most Important Product

GENERAL ELECTRIC

Pull Service Drop Cable Through Second Hole

BOBBIE McQUITTY, Lineman, Indiana & Michigan Electric Co, Elwood, Indiana

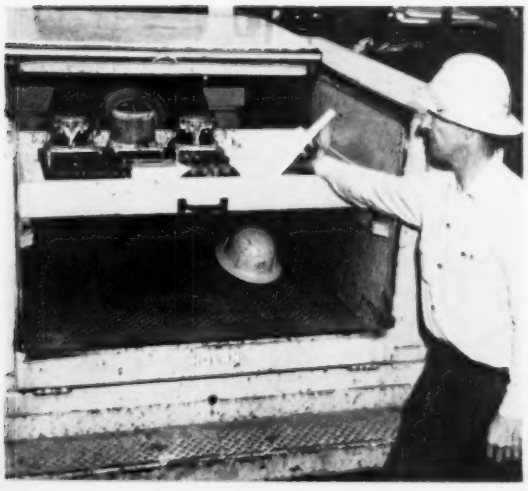
A second hole in the carton holding aluminum service drop cable speeds and simplifies the withdrawing of cable on the job. Experience in Elwood, Indiana, and in other parts of the Marion-Muncie Division indicates this second hole can save up to 1 hr per day for each two-man service crew. It also means a neater-looking service truck and lessens the possibility of injury.

With the advent of aluminum service drops provided in cartons, the practice was to stack several of them holding different sizes of cable in the truck. On every job the proper carton had to be removed from the truck, often necessitating the moving of all other cartons and tools as well.

Now the cartons are stacked upright, starting at the front end of the truck, with the long carton dimension at right angles to the truck bed. The first carton is placed with the perforated opening facing to the rear. As succeeding cartons are stacked in, similar openings are cut in the side of the carton opposite to the perforated opening. In cutting the hole, care must be used to avoid damaging the cable.

With all cartons in place, the desired size of cable can be pulled from any carton through the openings in all other cartons in back of it. Excess cable may be recoiled into its proper carton easily. As a result of this idea, manufacturers now are beginning to supply cartons with perforated openings on two sides.

Sliding Tray Carries Meters Safely



W. J. KOBEL, Meter Supervisor,
J. SWAGER, Meterman A, Ohio Power Co, Canton, Ohio

Delicate movements of meters installed on meter enclosure backboards are protected in transit from the shop to the job with a special tray designed and built by Ohio Power Co. This tray fits into the back of a service truck used for meter installation.

The sliding tray was designed especially to solve the problem of shocks to the meters. The tray, measuring 46x26x6-in. deep, has a 1-in. foam rubber pad in the bottom. The bottom of the tray is ¾-in. marine plywood; the sides, 1x6-in. poplar. The unit slides on ¼-in. square oak pieces.

The tray can be pulled to the rear of the truck for easy loading, then pushed toward the front for transportation. It can be made, installed and painted for less than $10 plus 4 man-hr of labor.

Charts Simplify Sag Calculations

R. A. **DEWBERRY**, Electrical Engineer, Montana-Dakota Utilities Co,
R. L. **SCHWAPPACH**, Electrical Engineer, Montana-Dakota Utilities Co,
Minneapolis, Minn.

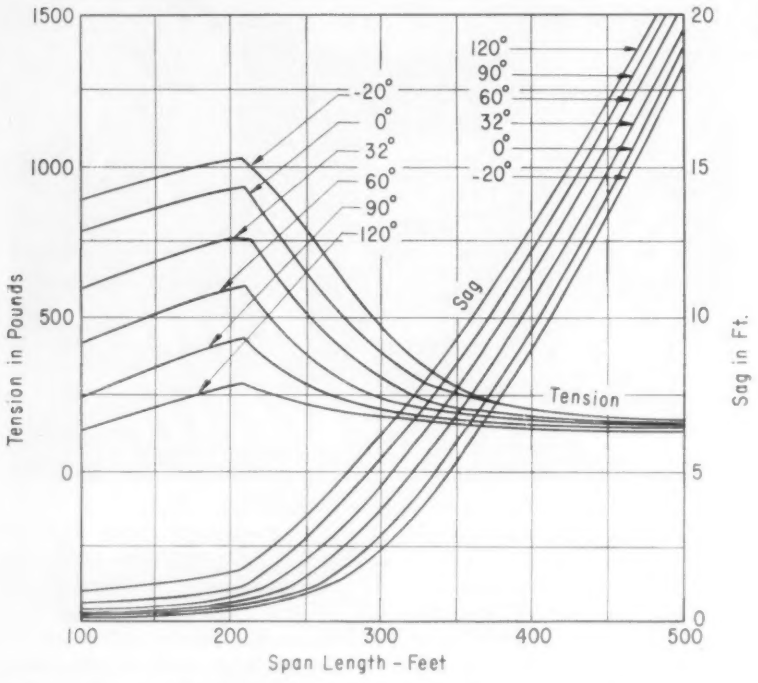


FIG 1—INITIAL SAG CHART for No. 2 ACSR 6/1, Heavy Loading, maximum tension 50% of ultimate for various temperatures

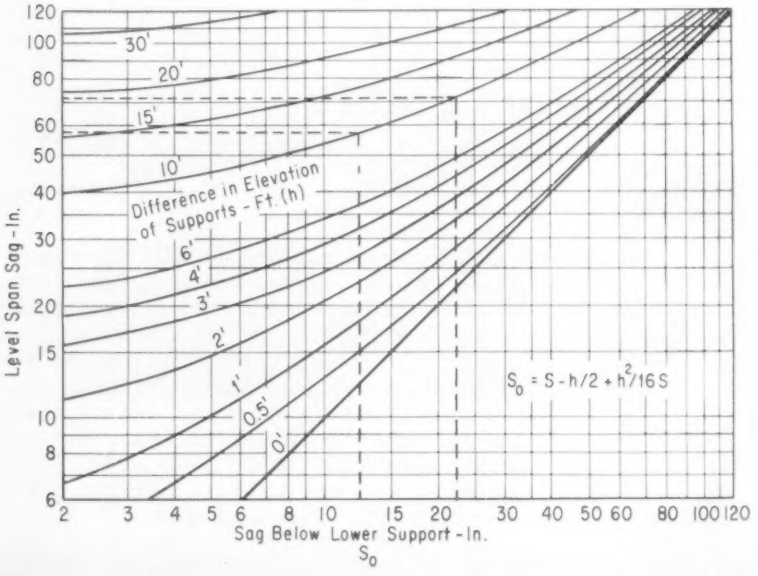


FIG 2—RELATIONSHIP of level span sag S and sag below lower support S_o for spans with supports of different elevations

Conductor sags can be read directly from charts as a function of ruling span, temperature and span length. The use of such charts will reduce the chance of errors and also reduce or eliminate the necessity of preparing sag tables.

The conventional way of determining sag for any particular line is to read the tension from the Initial Sag Chart corresponding to the stringing temperature and the calculated ruling span. This tension is then substituted in the formula

$$S = \frac{wD^2}{8T}$$

to arrive at the sag for any span length D.

The foregoing method is not particularly difficult. However, when it is necessary to compute sag for any desired span length based on a certain ruling span, considerable error is likely to result if sag tables previously calculated for a ruling span of, say, 350 ft are used on a line that has a ruling span of 340 or 360 ft.

Fig 1 shows the Initial Sag Chart for No. 2 ACSR-6/1, Heavy Loading, maximum conductor tension 50% of ultimate strength. If the factor w/8T is applied to enough points on the tension curves of Fig 1 and values thus obtained are plotted on logarithmic paper as a function of ruling span length, then it would be necessary only to multiply such values by D^2 (span length squared) to obtain sag.

The left portion of Fig 3 shows the curves obtained by multiplying values from Fig 1 by w/8T. Straight lines are drawn through the right side of Fig 3 corresponding to D^2 so that the abscissa of the right hand side of Fig 3 is the product of w/8T and D^2, or the desired sag. Thus the sag for any ruling span, temperature and span length within chart limits can be read directly. The only computation required is that of determining the ruling span. In the same manner, charts are prepared for the final sag.

Fig 2 shows the sag for spans

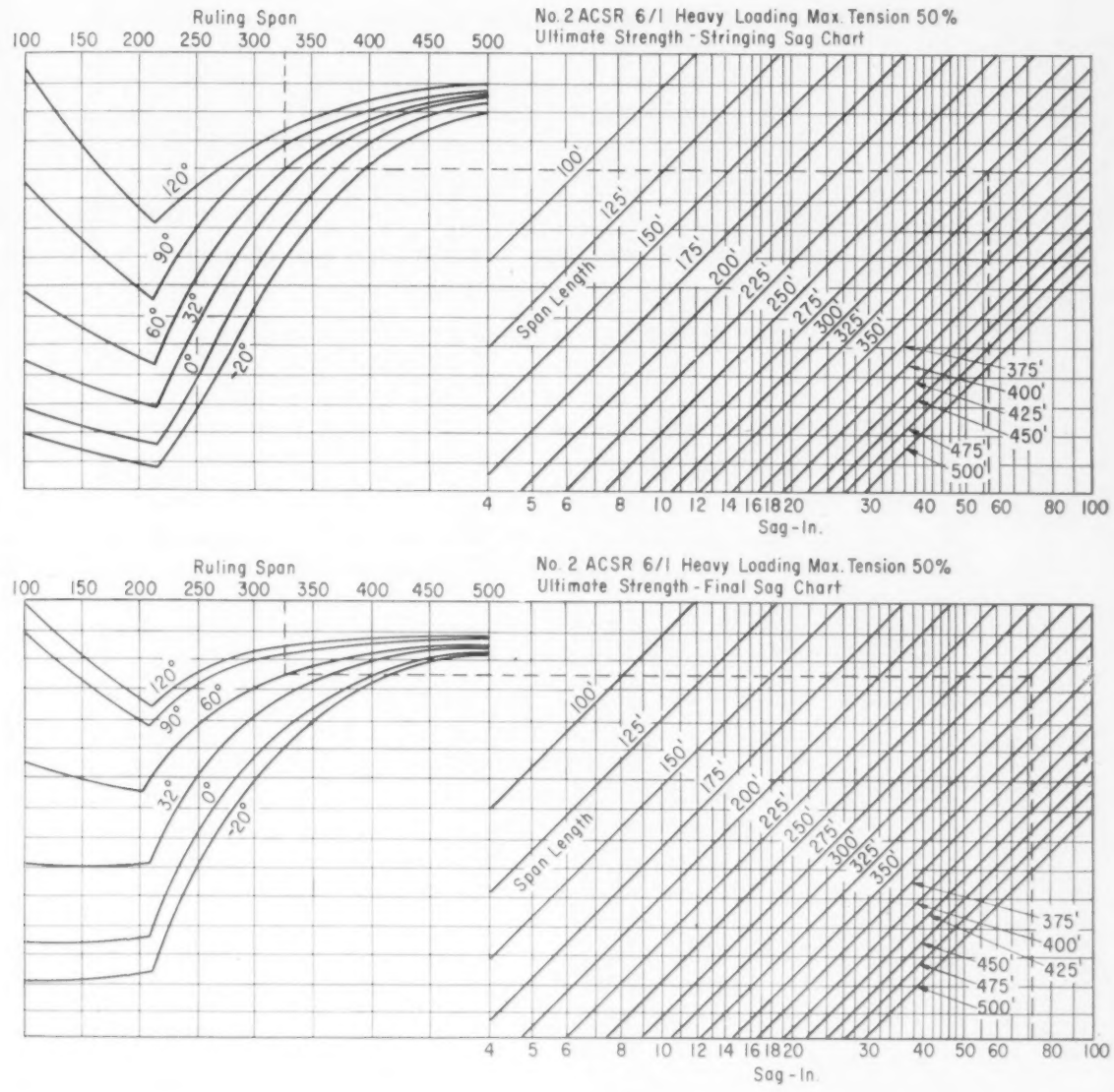


FIG 3—STRINGING SAGS and final sags for various temperatures and span lengths for No. 2 ACSR 6/1 Heavy Loading. Left portion is obtained by multiplying values from Fig 1 by w/8T. Lines through right side correspond to D^2

with supports at different elevations as a function of level span sag. This chart, of course, can be used independently of the manner in which level span sag is determined.

Example.

A certain section of line has the following span lengths between deadends: 318, 305, 309, 322, 312, 330, 325, 321, 308 and 300 ft. The average span length is 315 ft and the maximum span length is 330 ft. The ruling span is $315 + \frac{2}{3}(330 - 315) = 325$ ft. Determine from the charts what the sag should be in a 300-ft level span and for a 300-ft span with supports that differ in elevation by 10 ft. No. 2 ACSR-6/1, heavy loading, maximum tension 50% of ultimate and stringing temperature of 60F will be assumed.

Enter Fig 3 at ruling span = 325 ft, drop to 60F curve, project horizontally to 300-ft span and read 57 in. sag. Follow same procedure and read 71 in. for final sag.

The values of 57 and 71 in. are the stringing and final sag respectively for a level span. For the same span and conditions, but with supports at elevations differing by 10 ft, Fig 2 gives a stringing sag of 12 in. and a final sag of 22 in. below the lower support.

Procurement & Products

PRICES ▶ **"Worse than the 1957 White Sale"** is the way some manufacturers are describing the present price-cutting situation on electrical equipment used by utilities. Industry men are inclined to trace the bargain prices back to the antitrust indictments now pending against many manufacturers, but there are economic factors—lower demand and excess manufacturing capacity—that play important roles in the chaotic price picture.

Construction machinery manufacturers are plagued with a similar situation on prices, and no important antitrust actions are involved.

Prices on industrial materials generally are holding at about the same level as this time last year. Purchasing Week ascribes the hold-down on prices to a number of factors—hand-to-mouth inventory policies, foreign competition, overcapacity, substantial productivity rises, buyer resistance, and unexpectedly mild labor cost pressure thus far in the year.

Price reductions of up to 60% on CLF high interrupting capacity fuses were announced recently by General Electric Co. The company said it was also initiating a new stocking program which would enable the distributor to stock CLF fuses at competitive prices.

ACQUISITION ▶ **McGraw-Edison Co's acquisition of the Alrectic Div of** Handley-Brown Co includes a plant in Jackson, Mich., and Alrectic patents for a line of aluminum substation structures which will supplement products being manufactured by Line Material Industries. More recently, new Alrectic lattice poles for high-voltage electrical distribution and transmission systems were introduced and the development of an octagonal pole for street lighting was announced.

PRODUCTS ▶ **New outdoor fluorescent luminaire now in full production** by Line Material is designed to maintain maximum light output over a wide range of ambient temperatures. Available in a six-foot, four-lamp shallow unit, the controlled luminaire is said to produce a 72% increase in light output over an identical luminaire without the thermoelectric controlling device. Thermoelectric heat pumps supply the heating or cooling to keep lamps at maximum yield.

RATINGS ▶ **Kuhlman uprates complete line of distribution and power** transformers. P. M. Green Jr, general sales manager, said that all ratings 5 through 10,000 kva will be increased 12%. Thus a transformer rated 25 kva will provide 25 kva at 55C temperature rise and 28 kva performance at 65C rise with no sacrifice in transformer life. Upratings apply to both self-cooled and forced-air cooled units. New insulation system—known as Kuhlman SPI-65 helps make uprating possible, says Kuhlman.

CALCULATOR ▶ **First transistorized punched card calculator** to be offered at a rental of less than $1,000 a month has been announced by IBM.

announcing an important development

in low cost, hook-operated disconnect switching...

the DS

unmatched for...

ECONOMY—No other switch of its type offers the combination of features found in the low cost DS. You have a choice of key components to provide the precise performance characteristics to meet your switching requirements, whether on lines or in distribution substations.

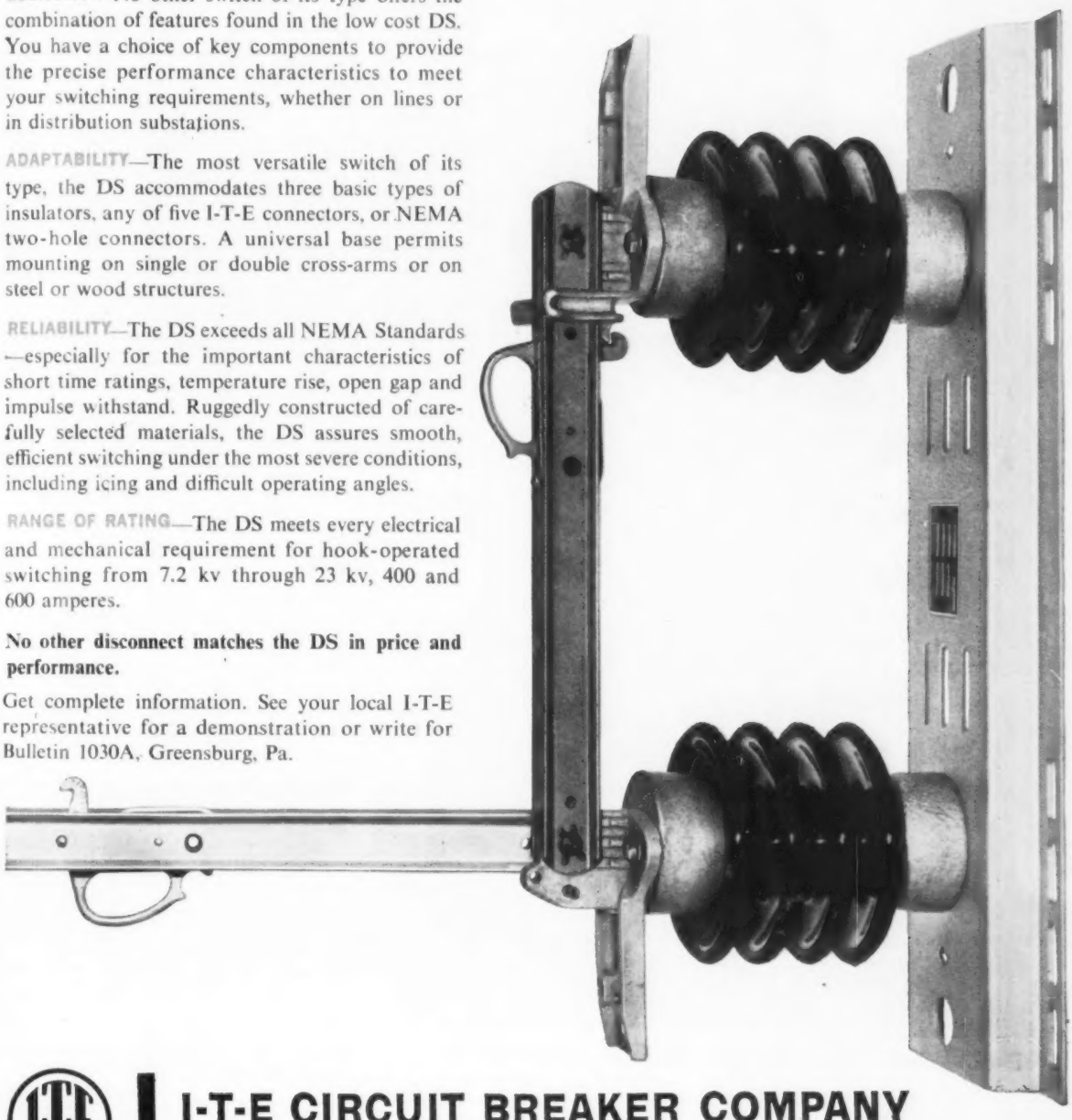
ADAPTABILITY—The most versatile switch of its type, the DS accommodates three basic types of insulators, any of five I-T-E connectors, or NEMA two-hole connectors. A universal base permits mounting on single or double cross-arms or on steel or wood structures.

RELIABILITY—The DS exceeds all NEMA Standards —especially for the important characteristics of short time ratings, temperature rise, open gap and impulse withstand. Ruggedly constructed of carefully selected materials, the DS assures smooth, efficient switching under the most severe conditions, including icing and difficult operating angles.

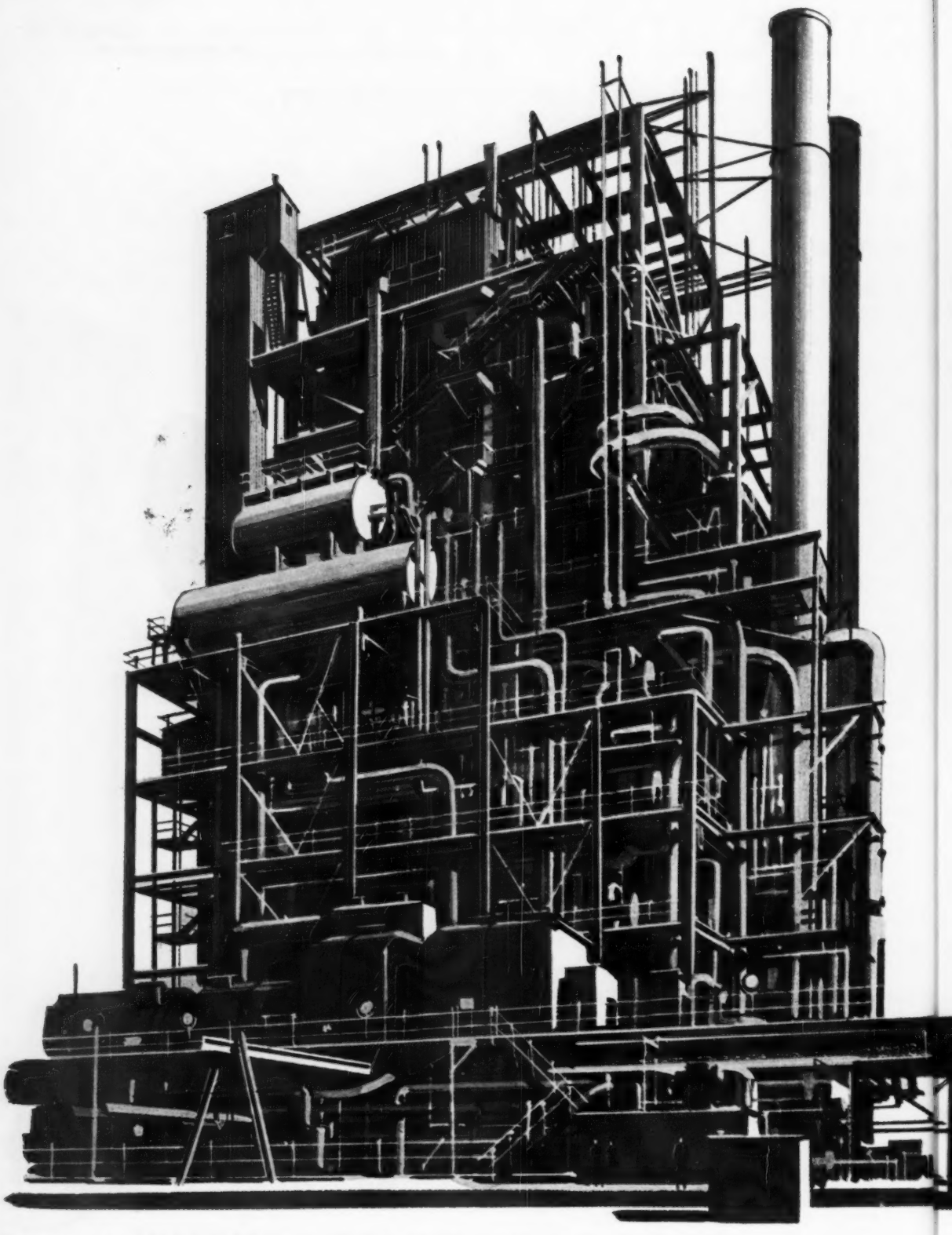
RANGE OF RATING—The DS meets every electrical and mechanical requirement for hook-operated switching from 7.2 kv through 23 kv, 400 and 600 amperes.

No other disconnect matches the DS in price and performance.

Get complete information. See your local I-T-E representative for a demonstration or write for Bulletin 1030A, Greensburg, Pa.

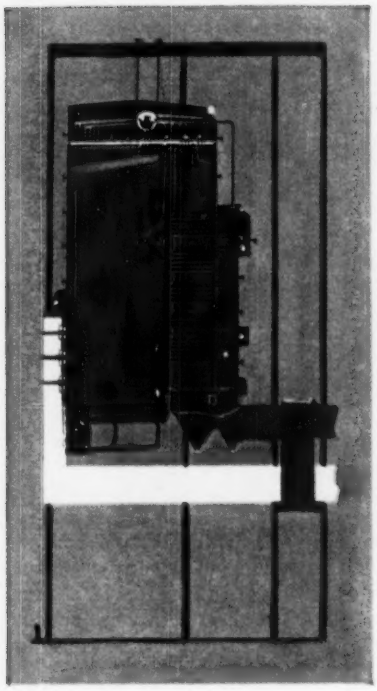


I-T-E CIRCUIT BREAKER COMPANY



POWER PLANT PRODUCTS HEAT ENGINEERED BY FOSTER WHEELER:

Central Station and Industrial Steam Generators • Steam Condensers and Pumps • Pulverized Fuel Systems • Feedwater Heaters • Packaged Steam Generators • Cooling Towers • Nuclear Components

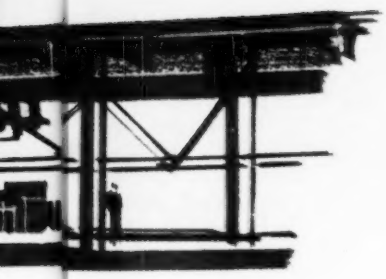


A word about steam generators

In this age of miracles some forthright words have been mislaid.

One is *thoroughness.*

Thoroughness is as much a product of our company as steam generators. By *thoroughness* we mean "careful attention to detail"—not some of the time but all of the time.

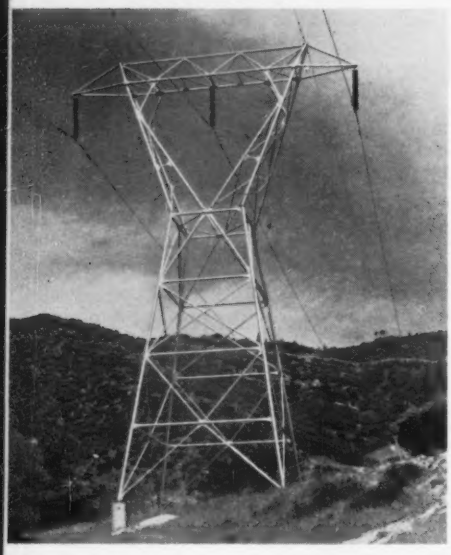


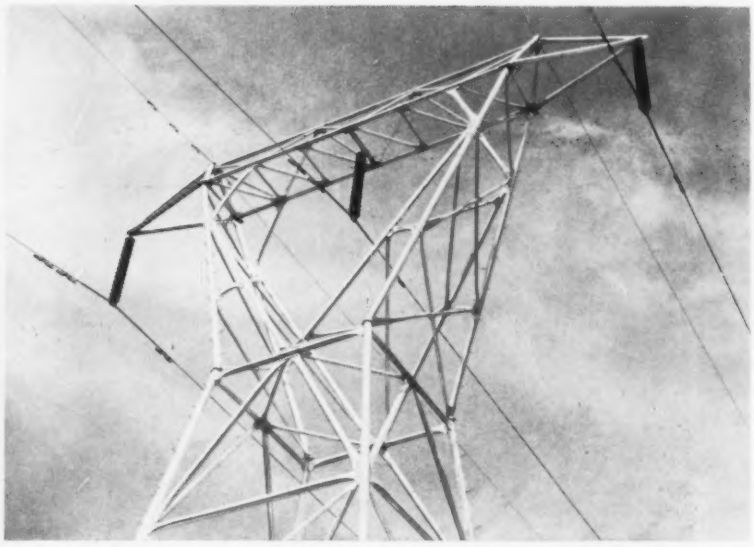
What does this mean to you? It means you save money on operations, keep your maintenance staff to a safe minimum, and prevent costly power interruptions.

Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, N.Y.

FOSTER WHEELER

NEW YORK LONDON PARIS ST. CATHARINES, ONT.





Tubular Aluminum Used for 230-Kv Towers

Hunter Engineering Co developed and designed this 230-kv, single-circuit tangent suspension tower of tubular aluminum structural members with the cooperation of Southern California Edison.

This is one of two identical prototypes which followed, in outline and general shape, a steel tower designed and now being used by SoCalEd for the same type of service. Comparisons were thereby provided in engineering data, economics of material, fabrication, and transportation, erection, and maintenance.

Deviations were made in the amount of bracing and details of fastenings when aluminum alloy 6061-T6 was used in the design instead of steel. Net weight of the aluminum tower, 4,300 lb, compared with the steel counterpart's weight of 10,500 lb.

One of the prototypes fabricated last fall was erected on a test site at the Hunter plant in Riverside, Calif. There a series of 15 loading tests was made, with the tower successfully withstanding the following maximum loads, all applied simultaneously: vertical load of 24,990 lb; transverse load of 15,172 lb; and longitudinal load of 12,000 lb at ground wire location.

Maximum torsion load was 276,000 ft/lb, resulting from a 12,000-lb load applied longitudinally from the tip of the crossarm.

Following the acceptance test, the second tower was erected last December near SoCalEd's new Mammoth Pool power house in the Sierra Nevada Mountains. Six months later, the tower was examined in detail, with no evidence shown of damage by snow, ice and wind.

At the Hunter test site, Bechtel Corp erected the tower, wishing experience. The tower near Mammoth Pool power house was erected by Fluor Corp. The crew, in spite of being unfamiliar with the construction, erected the tower in a little more than 5 hr, before stringing conductor and ground wire stringing ropes.

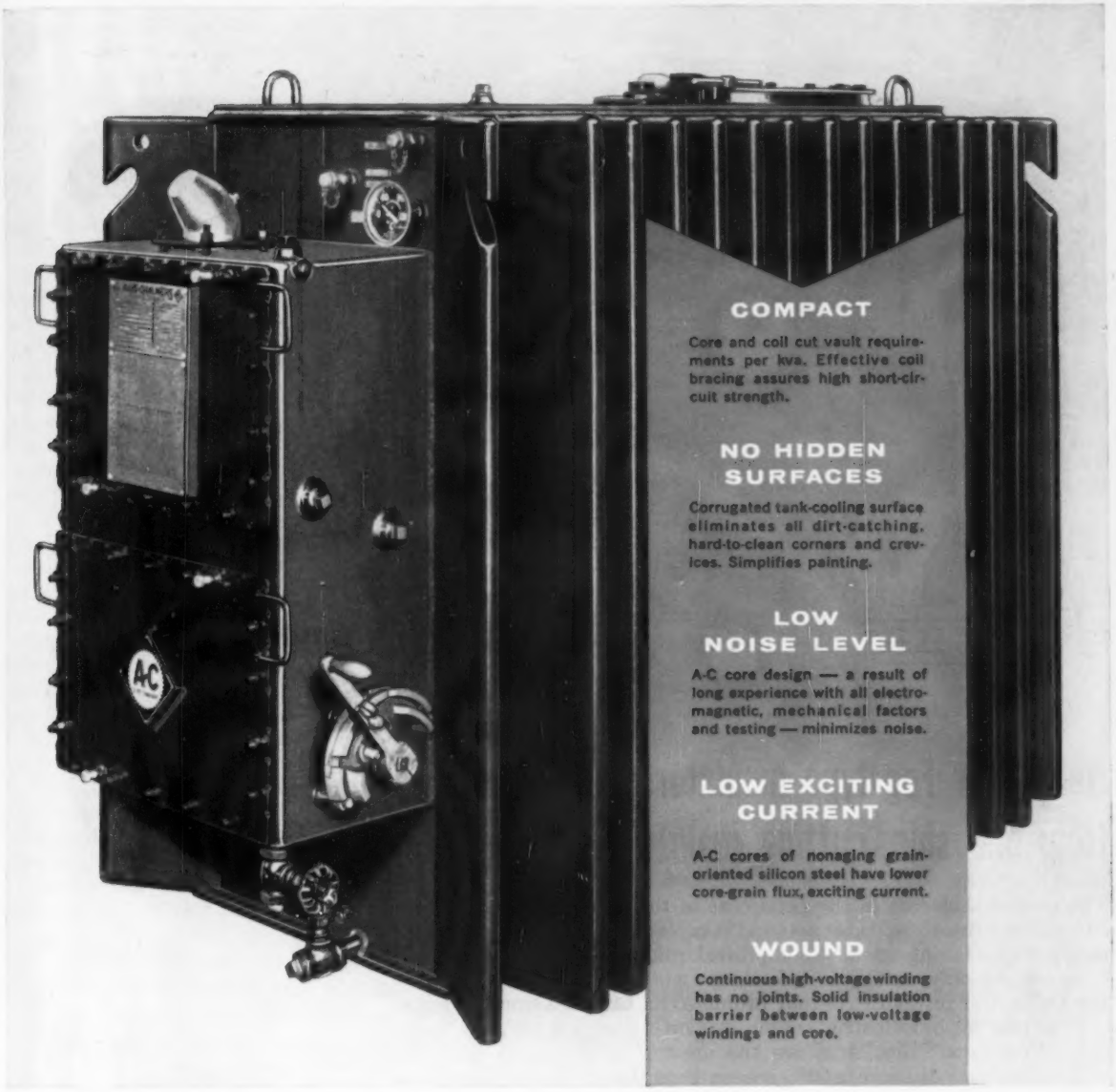
Mobile Electrostatic Precipitator Built

Koppers Co designed and built this mobile pilot electrostatic precipitator for Baltimore Gas & Electric Co to obtain engineering data on various precipitator operations at the Wagner Station. The Koppers project engineer who headed field testing, C. O. Humbert (photo, left), is shown explaining the unit's operation to James Stallings, BG&E control room engineer. Project was labeled by the company as the first of its kind using a mobile test unit.

Motivation for the project, as stated by Koppers' D. L. DeVries, manager of industrial gas cleaning, is trend toward increased power plant capacity. "It is our belief the data on which we base our present electrostatic precipitator designs may soon be inadequate. We therefore believe it is essential to more accurately evaluate the effect of pre-

(*Continued on page* 82)

ALLIS-CHALMERS



COMPACT

Core and coil cut vault requirements per kva. Effective coil bracing assures high short-circuit strength.

NO HIDDEN SURFACES

Corrugated tank-cooling surface eliminates all dirt-catching, hard-to-clean corners and crevices. Simplifies painting.

LOW NOISE LEVEL

A-C core design — a result of long experience with all electromagnetic, mechanical factors and testing — minimizes noise.

LOW EXCITING CURRENT

A-C cores of nonaging grain-oriented silicon steel have lower core-grain flux, exciting current.

WOUND

Continuous high-voltage winding has no joints. Solid insulation barrier between low-voltage windings and core.

Network news! smaller, vault-saving size

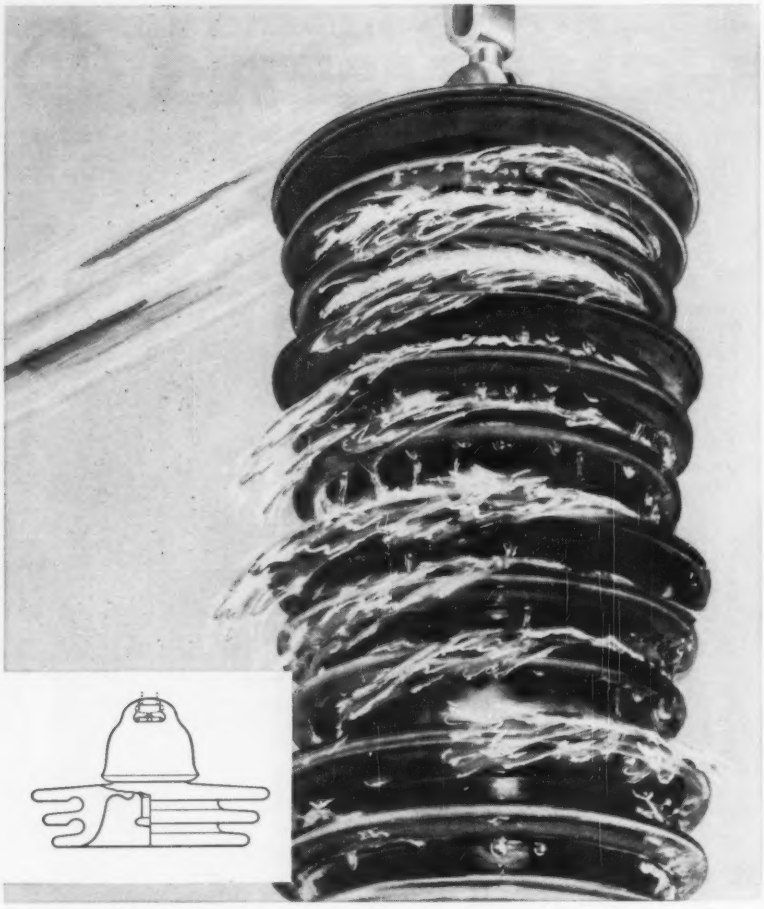
Smaller, lighter, more efficient — these advances mark the latest Allis-Chalmers network transformer developments. They're reliable, compact powerhouses — whisper-quiet performers.

And how they save you money! Reduced dimensions make them easier to handle, easier to lower into smaller, economy vaults. Your labor, equipment rental and operating costs nosedive.

Consider this, too! A new A-C network in an existing vault "opens up" previously tight quarters, eases routine inspections. Welded main cover ends gasket maintenance . . . bushings are easily replaced from outside in event of damage.

• • •

Whether you're thinking about a new or replacement network transformer, see your nearby A-C office and save money. Or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.* A-1317



Delta-Star Fog-type insulators can be cleaned from one side, cutting maintenance costs

The unique undercut in the petticoats of the Delta-Star "Fog-Type" Insulators causes the water to swirl completely around the unit. This means that cleaning can be accomplished quickly and easily by squirting from *one side only*, cutting maintenance costs substantially. In addition, the Delta-Star insulator contour promotes natural cleaning by rain.

Wherever fog or industrial contamination is a serious problem, Delta-Star "Fog-Type" Insulators are the answer to increasing flash-over values. Leakage distance is 50% greater than that of conventional insulators, and *effective leakage distance* is also increased by the greater freedom from conductive contamination.

Delta-Star "Fog-Type" Insulators are available in either ball and socket or clevis and pin types. For complete information on these maintenance saving insulators, write *Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 W. Fulton Street, Chicago 12, Illinois.*

DELTA-STAR PORTER **ELECTRIC DIVISION**

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

Mobile Precipitator

(*Continued from page* 80)

cipitator operating conditions such as gas velocity, rapping intensity, field length, power requirements.

"It will also be necessary to closely relate the physics and chemistry of the flue gas to these operating conditions and to the physics and chemistry of the coal being fired."

Initially, the unit will be operated at six carefully selected fly ash installations which will include three different types of boilers burning both eastern and midwestern coals.

Combinations of coals and boiler types will contribute at least six flue gases having sufficiently different physical and chemical properties to permit a statistical analysis of the effect of variances, according to Koppers engineers. The mobile unit will not interfere with the station's operations, and testing will be completed soon at each location.

The test unit, under development for over three years, was launched to gain information "of significant long-range benefit to utilities, Koppers, and the industry as a whole." Both the research and development department of Koppers' Metal Products Div and the industrial gas cleaning department participated.

The mobile unit differs from larger electrostatic precipitators only by the volume of gas it handles; it has all components and characteristics of the largest fly-ash precipitator. Mounted on a trailer truck, it will be moved to various locations easily. Installation, says Koppers, will be accomplished in a short time through connections in the existing duct work.

Longer Guarantee Offered After Priest Rapids Failure

English Electric offered to extend its one-year guarantee to five years on five 183-Mva transformers for Priest Rapids Dam. In addition, the company has offered Grant County PUD use of a spare transformer during the five-year period.

Reason for the offer is the failure of one of the transformers on April 25, resulting in damage to the wind-

(*Continued on page* 84)

Consult this expert on plant location

Build Your Plant Near An Unlimited Fuel Supply

The Squirrel is a sound planner. He builds his nest near Hickories and Oaks so that he will have a plentiful supply of nuts and acorns . . . *"fuel" for the Squirrel!*

Take a tip from the Squirrel. Locate your new plant near a large reservoir of fuel . . . Peabody's two-billion-ton coal reserves. Since shipping charges are a big part of your fuel costs, this close proximity to a dependable coal supply is just good business. It assures your Company an economical source of power for now *and* the years ahead, and protects your capital investment in buildings and equipment.

Let Peabody help you select *your* new plant site—it's an important part of our service . . . and one that can save your Company *millions!*

Learn more about the location of Peabody's 29 modern mines and river dock loading facilities. Write Industrial Development Division, Department EW.

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MODERNIZE

With General Electric Distribution Transformer Renewal Parts

Take advantage of up-to-date distribution transformer innovations with the complete line of General Electric replacement parts. You'll be able to utilize the higher 55° ● 65° dual-kva ratings now available with a new Permalex* core and coil. You can, for instance, boost kva as much as 236 percent—from 5 to 16.8 kva in the same low-voltage tank.

Other modern General Electric features you can profitably utilize include internally-clamped high-voltage bushing, low-voltage bushing with strenicor clamps, nitrile gaskets, low voltage circuit breaker with operating handle, overload signal light and Magne-valve distribution arrester.

You can get "off-the-shelf" delivery of General Electric renewal parts—and benefit from 24-hour emergency service provided by all of the 55 G-E Apparatus Service Shops.

For more information, see your General Electric Sales Engineer or the G-E Service Shop Representative. General Electric Co., Schenectady 5, N. Y.

* Trade-mark of G.E. Co.

485-03

Progress Is Our Most Important Product

GENERAL ELECTRIC

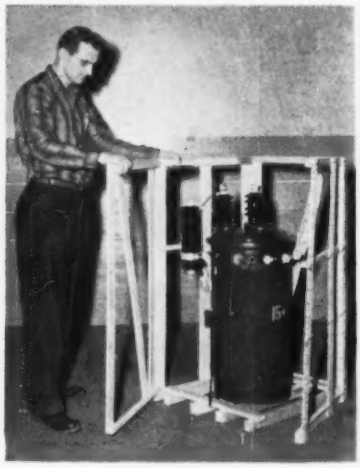
EE Extends Guarantee

(*Continued from page* 82)

ing of one phase. The damaged unit is back in England for repairs and modifications, while the remaining units will be modified in Canada. EE says, "The problem arose from the use of a 3-phase, 3-winding unit, a type of transformer which heretofore has rarely been specified in the United States."

Trouble has also been encountered at the dam with three of the ten EE generators, which have shown excessive temperature rise. These, along with a fourth, will be modified at the dam site and EE has offered to extend the guarantee on them to two years, from one year. The other generators have met the heat requirements.

It is expected that PUD will accept the guarantee offer. Date of operation of the last generating unit has been pushed back from September 1960 to April 1961, still well within the contract deadline of September 1961.



GE Improves Transformer Pallet Shipping Design

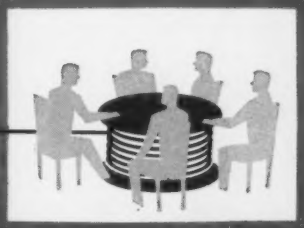
Crate enclosure developed by General Electric for 3-50 kva distribution transformers features new pallet design secured by straps and permits dismantling in 40 sec.

Main innovation is elimination of bolts; the transformer is strapped to pallet base and the sides of pallet interlock with base, forming a rigid

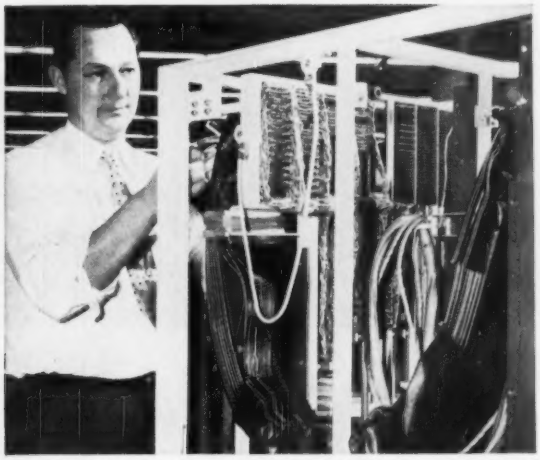
(*Continued on page* 88)

DU PONT

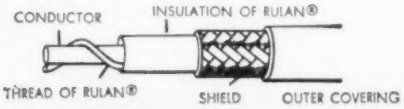
WIRE AND CABLE ROUND TABLE



Flame-retardant insulation of RULAN® used by IBM has five outstanding qualities



Approximately 1000 feet of cable are installed in each new IBM 7090 computer. Only the most dependable of insulating materials could meet the rigid requirements.



The unique design consists of a thread of RULAN spiraled around the conductor to provide for an air space between the conductor and insulation.

IBM's new 7090 fully transistorized data-processing system is the most powerful system to be marketed commercially. It has computing speeds more than six times faster than previous systems...can read and write 3,000,000 bits of information a second.

An air-spaced ribbon cable, insulated with Du Pont RULAN flame-retardant plastic, is used in the new 7090 Data Processing System, manufactured at the huge IBM plant in Poughkeepsie, N. Y. Performing such feats as reading and writing three million units of information a second, the 7090 relies heavily upon its electrical system. IBM selected a dependable cable insulated with RULAN, developed and manufactured by William Brand—Rex Division of American Enka Corporation, Concord, Massachusetts.

The most important consideration is the flame retardance of the insulation of RULAN. The possibility of fire in such an important and expensive machine, although slight, is not worth risking. Thus this insulation, with an excellent self-extinguishing capacity, proved acceptable. RULAN was also chosen because it has a low dielectric constant over a wide frequency range. Its excellent dielectric properties give RULAN still another useful quality—it can be thinner than many other materials.

Because the installation required that the cable bend around corners, it had to be flexible and have a good radius of bend. Again RULAN proved wholly acceptable. With approximately 1000 feet of cable installed in each machine, cost is an important consideration. And RULAN proved to be lower in cost than other suitable materials with the same properties.

You may find one of the Du Pont plastics will help you solve your wire and cable problems. Find out how by writing to your wire and cable supplier, or to: E. I. du Pont de Nemours & Co. (Inc.), Dept. M-711, Rm. 2507A Nemours Building, Wilmington 98, Delaware.

Du Pont does not manufacture wire and cable, but supplies thermoplastic resins for insulation and jacketing.

POLYCHEMICALS DEPARTMENT

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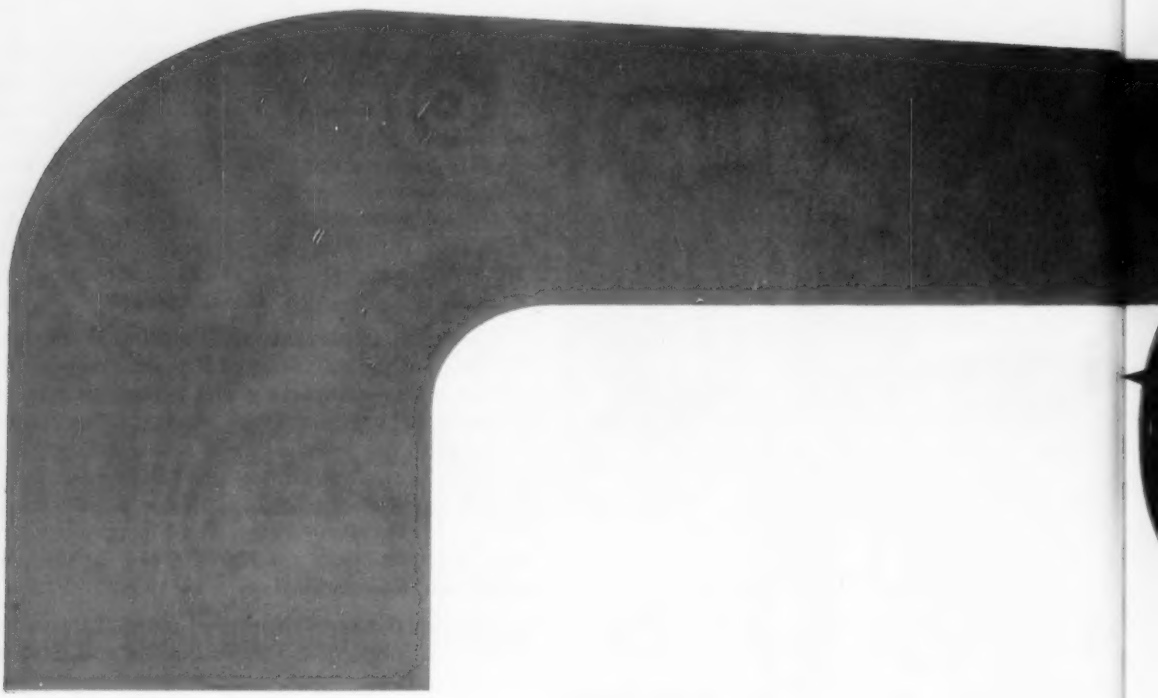
——Gas Tempering **Report No. 5**——

GAS TEMPERING

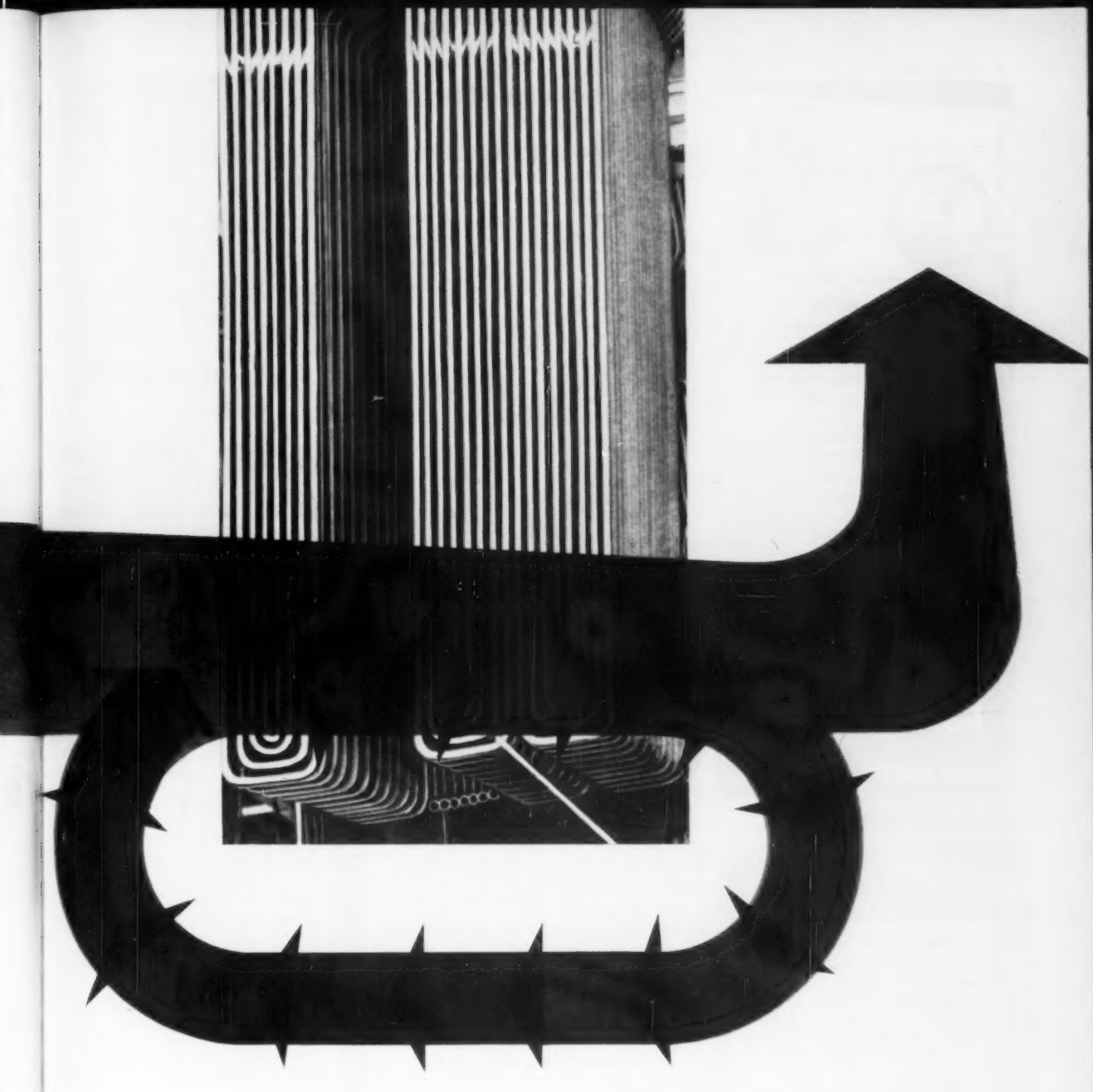
...its role in superheater protection



B&W perfected control principle supplies needed hea volume at lowered gas temperature . . . cuts super heater alloy requirements and reduces maintenanc

What is Gas Tempering? Gas Tempering is the introdu tion near the furnace exit of "cool" flue gases to mix wi —and thus control—the temperature of furnace gases ente ing the superheater.

Though these cooler flue gases appreciably lower furna exit gas temperature, total furnace or convection-pass he absorption is little affected since weight and quantity of g are increased.



How does Gas Tempering protect the superheater? The lower temperature of the gases entering the convection section a) greatly reduced ash fouling, corrosion and creep of the tube surfaces in the superheater, b) prevents "enameling" of ash on superheater tubes, c) reduces requirements for high alloys in superheater tubes, necessary with higher gas temperature.

Has Gas Tempering been proved in operation? YES! . . . Major B&W boiler installations all over the country are reporting excellent results with Gas Tempering. What's more, Gas Tempering has offered them many other important operating advantages in addition to superheater protection.

For the complete story on Gas Tempering—its relation to boiler design and operation plus typical case histories—write for B&W Bulletin G-96. The Babcock & Wilcox Company, Boiler Division, Barberton, Ohio.

G-977

B&W

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BOILER DIVISION

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"When we bid on a T&D job, we have to figure *cost, speed, quality* and a *fair profit*. Since we started using Superforms, we've eliminated many former errors and inconsistencies in practices.

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TAP ARMOR... Protects conductor at tapping points

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FANNSPLICES... Join two ends of conductor wire

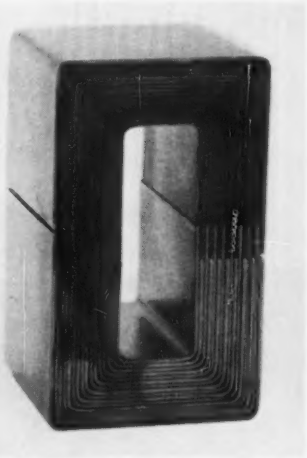
PLASTIC PRODUCTS... For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

GE's Shipping Method

(*Continued from page* 84)

assembly. This eliminates the necessity to chop or tear at crate for removal. When required, crate sides can be removed easily at the warehouse and the transformer shipped on the pallet only.



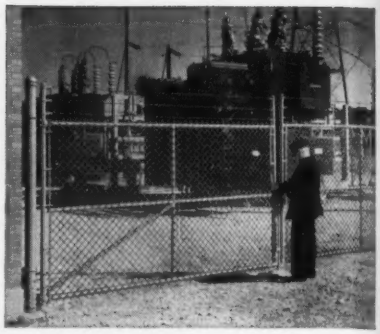
Sylvania Introduces New Transformer Core Design

Sylvania Electric Products Co has introduced a new type of transformer, the Flexi-core, which uses interleaved, nested, U-shaped laminations (above) to form the core. The illustration shows one-half of the two-loop core. Weight and size reductions of transformers range from 2 to 30%, says the company, while electrical characteristics are the same as for conventional transformers.

The core design, points out Sylvania, will lend itself to mass production. At present, however, sales efforts are limited to small transformers for use in general products. The company is eyeing the distribution transformer market for "say, five years from now."

The new design allows the magnetic lines of force to flow continually with the grain of the steel, rather than across the grain as in transformers with conventional E and I-shaped laminations. Transformers have been limited to these designs, says Sylvania, because of the dies used in the laminations.

(*More Procurement & Products, p* 93)



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3. INSTALLATION is important, too. A fence can be no better than the quality of its erection. The Page Fence Member in your locality is trained, experienced, responsible, and interested in your satisfaction.

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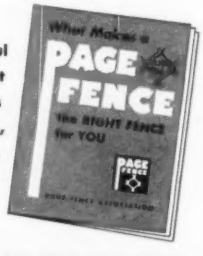
When you write us, we'll send you the whole story in a helpful booklet, and the name of our nearest Member. Call him, he will gladly suggest the best answer to your property protection problem.

Helpful booklet describes fence styles, gates and, components



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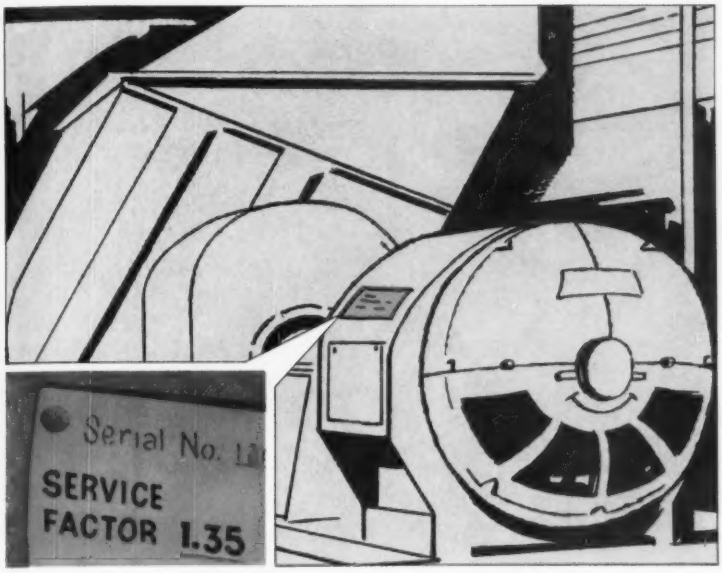
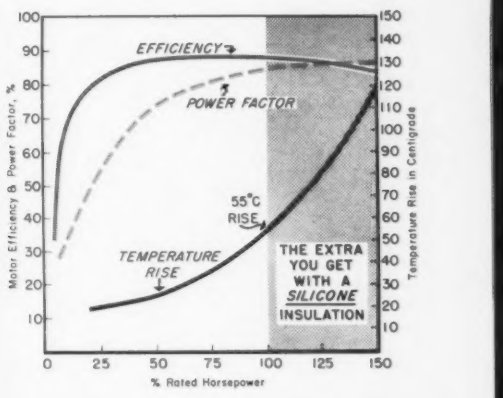
SILICONE NEWS from Dow Corning

Economy vs Reliability?





You Get Both When You Specify High Service Factor Motors for Auxiliary Drives

Motors built to entirely new design concepts are now available from leading manufacturers! They *look* like other motors. But they differ radically in performance . . . they'll carry overloads of fifteen to fifty percent *above* nameplate horsepower rating. They're insulated with Dow Corning Silicones for increased service factor!

THIS INCREASED SERVICE FACTOR:

1. ***Simplifies Motor Specifications.*** With increased service factor motors, you can match nameplate horsepower ratings to nominal loads . . . these motors are well-equipped to handle temporary, or even continuous overloads. Generally, there's no need to calculate maximum loads. All the safety factor that motors normally need . . . even for fan and pump loads . . . is already built-in!

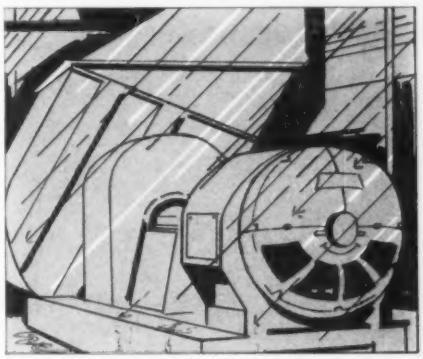
2. ***Reduces the Cost of Horsepower.*** With motors rated to average loads, the total installed horsepower is substantially less . . . and it costs less! If accepted application engineering practices are followed, additional savings result from lowered transformer and switchgear requirements . . . motor mounts and accessories cost less . . . and motors are easier to install.

3. ***Increases Reliability.*** In addition to increased service factor, thermally stable Dow Corning silicone insulation assures motor reliability in the high ambient areas near boilers, stacks, and high temperature processing equipment.

For more information on what silicone insulated service factor motors can mean to you, write Dept. 3107.

How do manufacturers build so much extra into a motor? By substituting an insulation system made from Dow Corning Silicones for the Class A insulation systems used in standard lines. Only the insulation is changed. Frame, electrical steel and copper remain the same. And there's one change on the nameplate—*service factor rating goes up!*

On a TEFC motor, for example, service factor goes up from 1.00 with Class A insulation materials to somewhere between 1.15 and 1.50 when silicones are used.



Simplify Enclosures. You can also save by specifying silicone-insulated motors for outdoor service. The reason: "Self-protecting" insulation systems made with Silastic®, the Dow Corning silicone rubber, require no premium priced enclosures. You can specify open frames. No need to protect the insulation against outdoor elements.

SPECIFY Dow Corning Silicones and SAVE!

first in silicones

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10,125 tests a day assure consistent quality in every Gulf® pro

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Those bottles you see above contain samples of a variety of Gulf fuels and lubricants, each of which has been subjected to a series of scientific quality control tests at Gulf laboratories. Any one of the tags shown might carry the "pedigree" of a Gulf product your company bought today for use in its plants or motor fleet.

Product purity is policed constantly at Gulf. During the refining process, samples from *every* lot of Gulf gasoline, diesel fuel, lubricating oil and grease are tested and re-tested to make sure that formulations are exact and that impurities are essentially eliminated. For example, Gulfcrest® 44, world's leading turbine oil, is quality-controlled to limit contamination to less than one part per million.

Every Gulf product you purchase bears positive evidence that it is precisely what you ordered. From the lot number on the container, your Gulf office can determine which refinery made the product and the day it was made.
each ir
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gives
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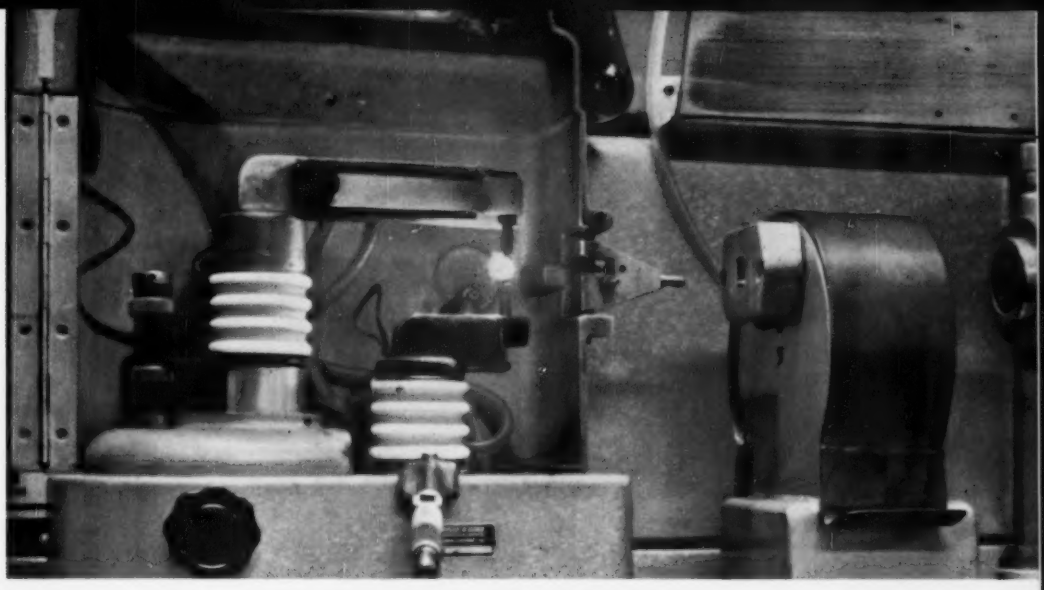
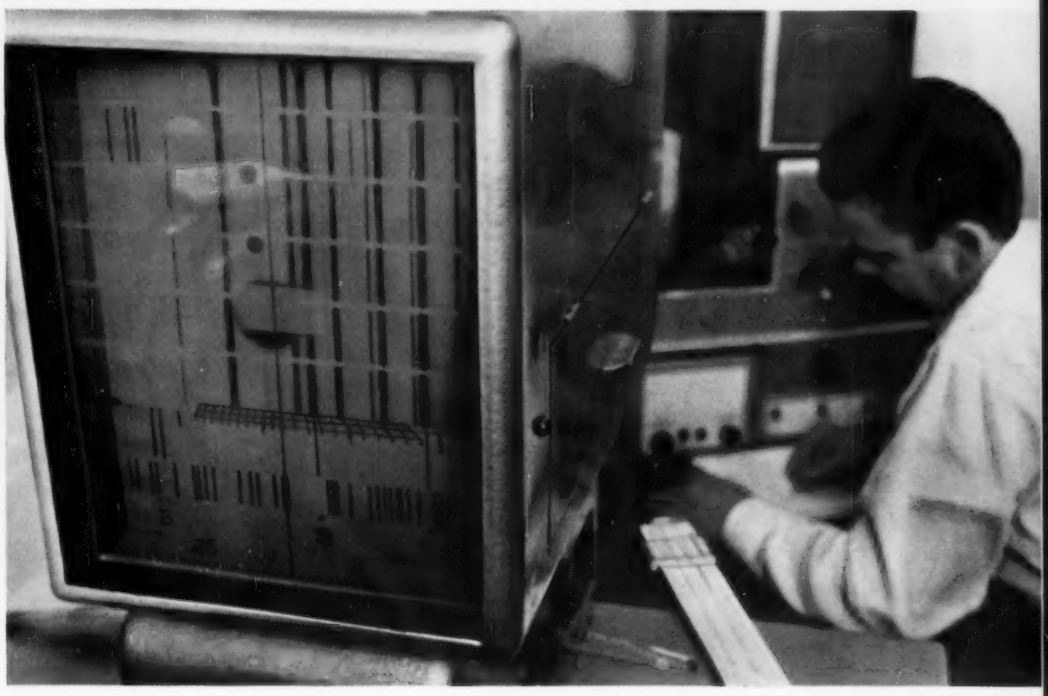


Emission Spectrograph (above) causes undesirable elements in a petroleum sample to emit their characteristic light spectrum which is photographed on a strip of film. In the Densitometer (below) the spectrum on the film is evaluated to identify the presence of metal contaminants down to less than one part per million.



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Get the complete quality protection that Gulf testing gives you. If your company uses petroleum products in any way, find out how Gulf makes things run better! Just call your nearest Gulf office.

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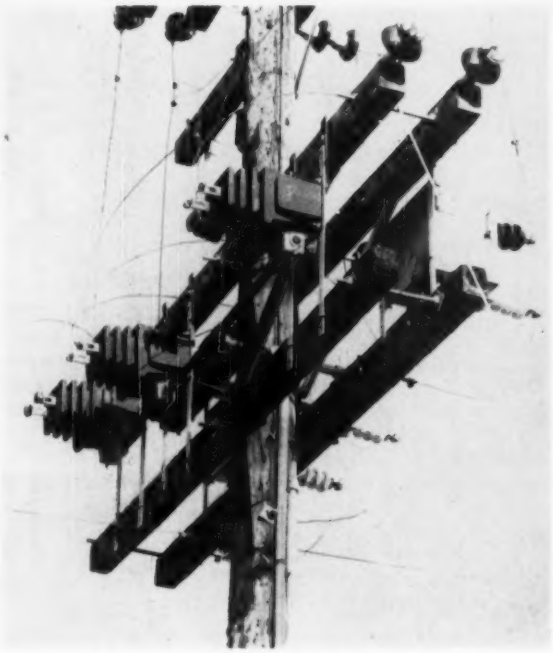
(For further information refer to Readers Service on page 100)

Pulsating Panels . . .

. . . of inflatable neoprene keep coal in bins moving without caking, funneling or bridging. PneuBin panels installed on the interior surfaces of a bin or bunker expand and deflate alternately to insure continuous flow. The steel-backed panels, which are air-driven, can be operated by automatic control adjustable for rate, amplitude and force of pulsation. They run quietly and do not create dust.
Gerotor May Corp, Cockeysville, Md.

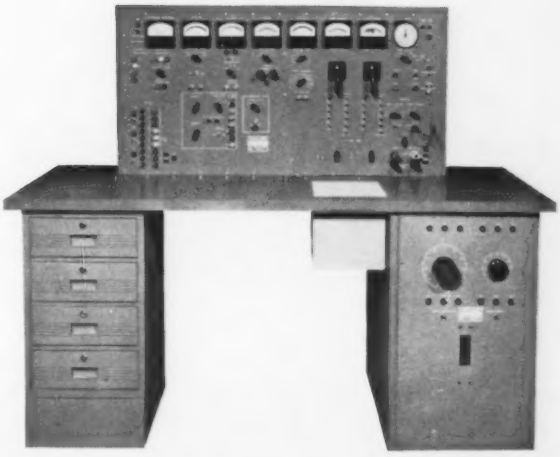


Current Transformer . . .

. . . of molded construction has no bushings to break and needs no painting. The outdoor type CTOM-15 is available in current ratings from 10/5 through 800/5; voltage rating is 15 kv. Smaller and lighter than the replaced type, the molded current transformer has a 1.5 rating factor through 600 amp, hence 50% more overload capacity than the superseded type CTO. A large removable conduit box is furnished with each unit.
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Relay Test Table . . .

. . . checks nearly all protective relays used on electric power systems. Built-in instruments include a timer that measures from a ¼ cycle to 60 sec, ammeters and voltmeters, megohm meter and phase angle meter. The equipment furnishes a variety of dc, single-phase and 3-phase current and voltage outputs for testing various relays and functions. The unit is 6 ft wide.
Multi-Amp Electronic Corp, Box 217, Union, N. J.



(More New Equipment on page 96)

PREFERRED L

program to provide mo

General Electric introduces *PREFERRED LIGHTING* —a new program offering *exceptional customer service* on outdoor-lighting systems.

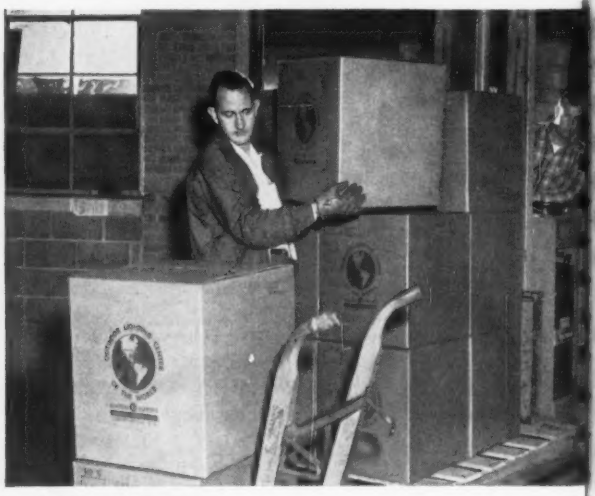
With *PREFERRED LIGHTING* you get a full selection of fast-moving equipment—equipment most preferred on a national basis as evidenced by present purchases—plus application analyses combining the latest lighting trends and the most economical and effective ways to do specific lighting tasks.

In addition, *PREFERRED LIGHTING* makes possible exceptionally fast delivery of street-lighting systems. On products of our own manufacture, equipment is usually in your hands in one to three days after receipt of your order.

General Electric offers you the widest variety of equipment necessary to meet your general and special lighting needs. But, your optimum use of the "customer-selected" *PREFERRED LIGHTING* systems will bring the immediate benefits of superior product performance . . . one-to-three-day delivery . . . easy selection, ordering, and application . . . all adding up to top value for your lighting dollar.

PROVED EQUIPMENT PERFORMANCE

When you select G-E *PREFERRED LIGHTING* equipment you'll know you are buying the type of equipment which has proved most popular with customers all across the country—*preferred* by a majority of customers for performing the same lighting tasks



QUICK DELIVERY—one-to-three-day delivery is maximum for most General Electric *PREFERRED LIGHTING* equipment including pole anchor rods and base templates. Poles can be ordered for one- to four-week shipment, allowing time for curing concrete bases prior to installation.

PROVED PERFORMANCE results because General Electric *PREFERRED LIGHTING* represents customers' choices of the best in filament, mercury, and fluorescent lighting. Only 148 catalog numbers (5000 are available) meet 95% of all roadway lighting needs.

LIGHTING... a new General Electric
more light per dollar on America's roadways

you are interested in solving. These systems have met the test of customer evaluation in terms of cost of light, and over-all operating and maintenance economy ... *your best guarantee of a modern lighting installation.*

ONE-TO-THREE-DAY DELIVERY

With *PREFERRED LIGHTING*, you can reduce your inventory investment. Much of your warehousing and inventory expense is borne by General Electric.

A simplified product line, pre-designed lighting systems and layouts, and the ability to order from a single source mean you can order most lighting equipment by phone. What's more, in most cases you can expect to have your equipment at the installation site within one to three days of your order!

SIMPLIFIED SELECTION AND APPLICATION

General Electric's new *PREFERRED LIGHTING* Designer's and Buyer's Guide is a compilation of all pertinent data you need to select, order, and apply complete lighting systems or components.

By following "customer-approved" *PREFERRED LIGHTING* recommendations, you save the time and expense of individual lighting layouts and calculations. Factors such as distribution patterns, spacings, mounting heights, and maintenance factors are already worked out in advance. Just select the type of lamp and the footcandle level you desire.

PREFERRED LIGHTING IS AVAILABLE NOW

Get your *PREFERRED LIGHTING* Designer's and Buyer's Guide, today! Use it as a basis for a thorough evaluation of your present buying practices, in comparison with the benefits offered by General Electric's *PREFERRED LIGHTING* approach. Your G-E Apparatus Sales Engineer or Agent will be happy to help. General Electric Company, Outdoor Lighting Dept., Hendersonville, N. C.

Progress Is Our Most Important Product

GENERAL ELECTRIC

EASY APPLICATION saves you the time and expense of designing individual layouts, and considering distribution patterns, spacing, mounting heights, and maintenance factors. Selection of *PREFERRED LIGHTING* equipment is a simple matter of deciding on source and footcandle level.

New PREFERRED LIGHTING Guide

General Electric Company
Section A 460-02
Schenectady 5, New York

Please send me a copy of the new General Electric *PREFERRED LIGHTING* Designer's and Buyer's Guide, GEA-7100, with descriptive, application, and ordering data on the complete line.

Name _____

Company _____

Address _____

City _____ State _____

Research
Responsibility
Results

WHEREVER GASES ARE
CLEANED OR HANDLED...

Aerotec Industries offers more than a half century of world wide experience in engineering and manufacturing equipment for efficient and economical cleaning and handling of air and gas. Single responsibility for complete systems, from design to final installation, assures management that overall performance guarantees will be met. Write for information on the products of interest.

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Divisions: INDUSTRIAL • Electrical and Mechanical Dust Collectors • Wet Collectors • Fans • Fan-Stacks • Blowers • Gas Scrubbers • Air Preheaters • Curtain Dampers.
AIRCRAFT EQUIPMENT • Advanced electro-mechanical equipment for the aircraft, missile and nuclear industries.
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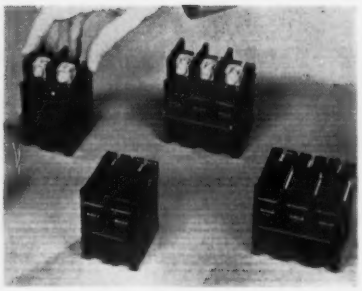
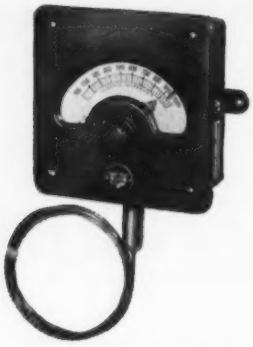


Molded-Case Breaker . . .

. . . **is redesigned** with full width handle, which permits easier operation and clearly shows which poles belong to that breaker. Isolating air barrier between poles allows free air flow. The EQ line is furnished for 120 and 240 v ac, 10-100 amp, with 1, 2 or 3 poles.
I-T-E Circuit Breaker Co, Philadelphia 30, Pa.

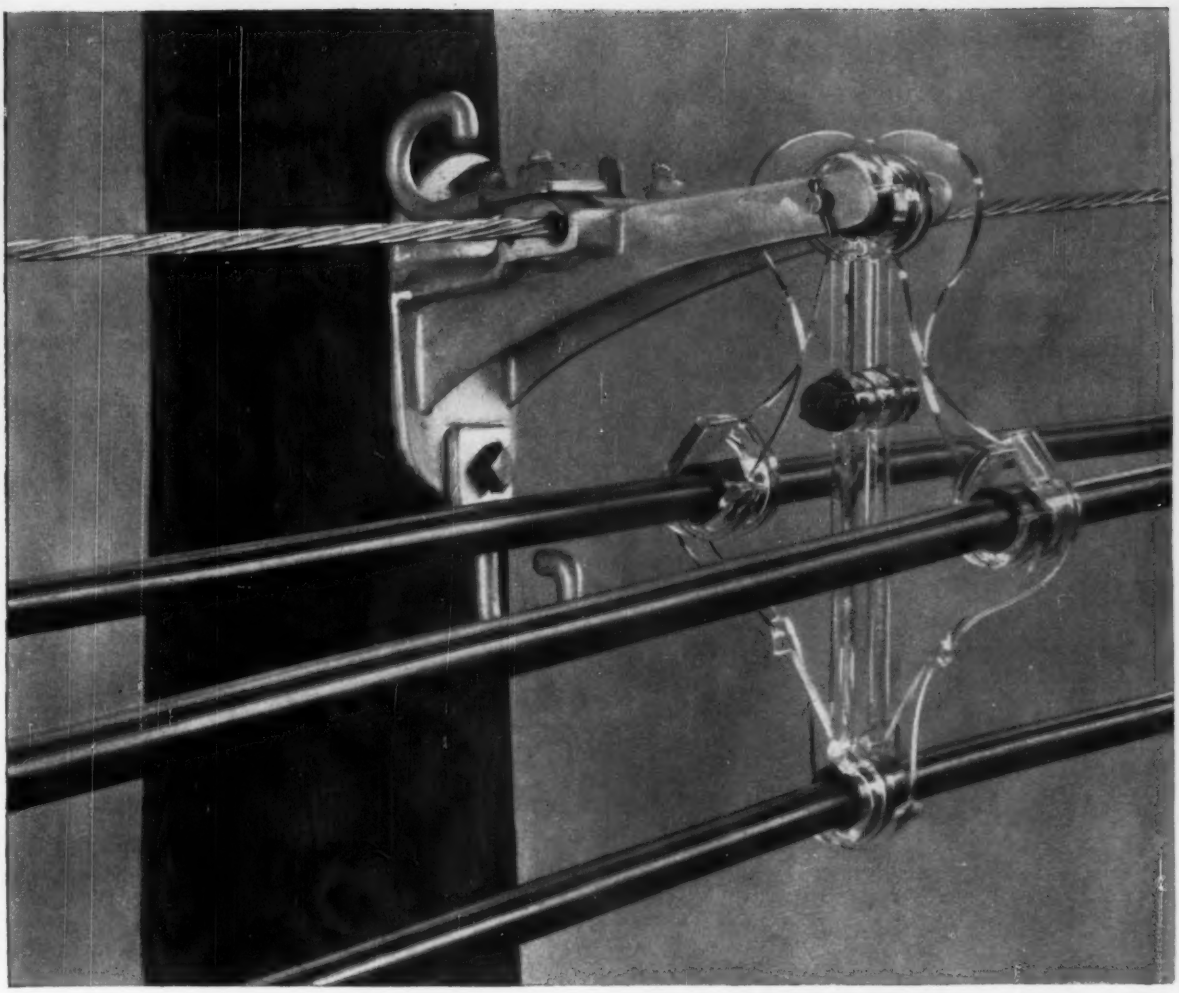


Temperature Control . . .

. . . **and indicator** is furnished in three models, covering the range 100-1,000F. Control can be set anywhere within scale limits. Type E36N is suitable for ambients to 180F. Its double throw switch is rated at 15 or 20 amp, 115/230 v ac.
United Electric Controls Co, 79 School St, Watertown 72, Mass.

Rust Inhibitor . . .

. . . **is colorless** and does not discolor metal. Poly-Rustex comes ready to brush, spray, mop or dip on iron and steel without mixing. One gallon covers up to 400 sq ft.
(*Continued on page* 100)



FOR TROUBLE-FREE INSTALLATION AND SERVICE...
AERIAL SPACER CABLE INSULATED WITH HIGH-DENSITY POLYETHYLENE

Aerial spacer cable, line wire, and triplex service drop made by Hendrix Wire and Cable Corp. and insulated with BAKELITE Brand high-density polyethylene DGD-4100.

One of the most impressive developments in the past two years has been the quick acceptance of aerial spacer cable insulated with BAKELITE Brand high-density polyethylene DGD-4100. The properties of this new polyethylene are so compelling that one manufacturer, Hendrix Wire & Cable Corp., Milford, N.H., reports that 34 utility customers* in 15 northeastern states have adopted aerial cable, line wire or triplex service drop insulated with DGD-4100.

The abrasion resistance of this high-density polyethylene sharply reduces the chance of injury to insulated phase conductors when stringing over crossarms. It also results in less damage by tree limbs—can even bring some reduction in tree trimming costs.

Along with these benefits, high-density polyethylene provides excellent shear strength, resists environmental and thermal stress cracking, and withstands deformation at high temperatures. These improvements are in addition to the familiar polyethylene advantages such as superior insulating properties, light weight, and ease of handling.

Try wire and cable insulated or jacketed with BAKELITE Brand high-density polyethylene DGD-4100 in your power distribution system and enjoy these multiple benefits. For more information and samples of this material, write Dept. BW-43, Union Carbide Plastics Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N.Y. In Canada, Union Carbide Canada Limited, Toronto 12.

UNION CARBIDE

*Names available upon request.

"Bakelite" and "Union Carbide" are registered trade marks of Union Carbide Corporation.

NEW SPRING-MANUAL CLOSING MECHANISM provides positive manual operation of DB-15, DB-25 and DB-50 circuit breakers used in Westinghouse power centers. Here G. D. Gamel, DB breaker design engineer, is ready to close a spring-manual operated DB-50 unit.

Westinghouse power centers offer greatest component selection . . . plus new switchgear insulation

You Can Choose the Breaker Operation You Need. Low-voltage air circuit breakers (DB-15, DB-25 and DB-50) provided in Westinghouse power centers are now available with a choice of manual, spring-manual or electric closing mechanisms. In accordance with industry standards, DB-75 and DB-100 breakers are available with an electrically operated closing mechanism only.

You Can Choose the Transformer You Need. As with breaker closing mechanisms above, Westinghouse gives you complete freedom of choice in selecting the power center transformer best suited to your application. Within code limitations, you can choose *oil-filled* for outdoor service . . . *Inerteen®-filled* for outdoor or indoor service where a nonflammable, liquid-cooled transformer is desirable . . . *ventilated dry-type* for maximum safety and minimum maintenance under controlled atmospheric conditions, indoors . . . and *sealed dry-type* for complete safety and virtually no maintenance, under adverse atmospheric conditions, indoors or outdoors. All dry-type transformers are equipped with low-ratio RM lightning arresters.

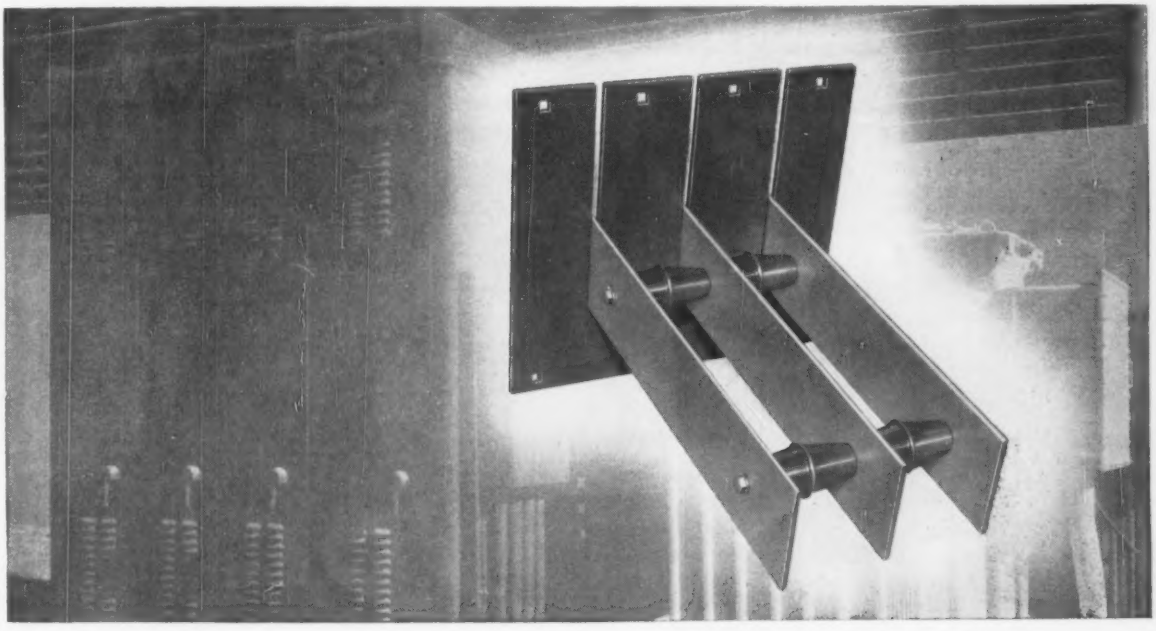
New Westinghouse Insulation of improved glass polyester material is used for bus supports and short circuit bracing in Westinghouse low-voltage metal-enclosed switchgear. In addition to being highly track resistant, this new insulation is also flame retardant, and the design of supports and bracing provides increased vertical creepage distances. Result is maximum safety with minimum maintenance.

These features are only a few of the continuing product improvements that provide true bonus values beyond specification in Westinghouse power centers. For complete details, call your Westinghouse representative or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. J-60979-R

YOU CAN BE SURE... IF IT'S **Westinghouse**

TUNE IN WESTINGHOUSE-CBS TV-RADIO COVERAGE, PRESIDENTIAL CONVENTIONS, JULY 10-29

NEW WESTINGHOUSE GLASS POLYESTER INSULATION is used for bus supports and bracing in low-voltage metal-enclosed switchgear of Westinghouse power centers.



Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

Gerotor May....Pulsating Panels ☐
Westinghouse .....CT ☐
Multi-Amp.....Relay Tester ☐
I-T-E .....Breaker ☐
United Electric Controls..Temperature Controls ☐
Brad Chemical.....Rust Inhibitor ☐
Laboratory for Electronics.....EDP Storage ☐
Vapor Recovery Systems....Supervisory Control ☐

OTHER

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Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

* Note: Requests must be received within four weeks of publication date, accompanied by complete information specified. This service cannot be offered to readers in foreign countries or to competitive manufacturers.

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TITLE_____
DEPT._____
COMPANY_____
ADDRESS_____

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FOR:

Reference ..... ☐
Specs ..... ☐
Trial ..... ☐
Purchase ..... ☐

JULY 11, 1960

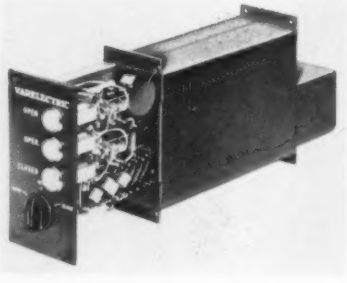
Rust Inhibitor . . .

(*Continued from page* 96)

Because it has low viscosity and does not settle or freeze, Poly-Rustex can be stored outdoors.
Brad Chemical, Inc, 111 W Washington St, Chicago 2, Ill.

Computer Data Storage . . .

. . . device stores 100,000 bits on a flexible rotating disk of thin magnetic mylar material. The unit measures 9x9x5 in. and weighs 15 lb. Speed and read/write bit rate are adjustable to match the computing equipment. The Bernoulli Disk-100 series units can be mounted vertically or horizontally, require no warmup and are unaffected by vibration.
Laboratory for Electronics, Inc, 1079 Commonwealth Ave, Boston 15, Mass.



Supervisory Control . . .

. . . system needs only two wires per unit to connect with motor or valve controlled, plus system common. Power source is dc.
Vapor Recovery Systems Co, 2820 N Alameda St, Compton, Calif.

Crapo
GALVANIZED STEEL STRAND HAS ALL
5

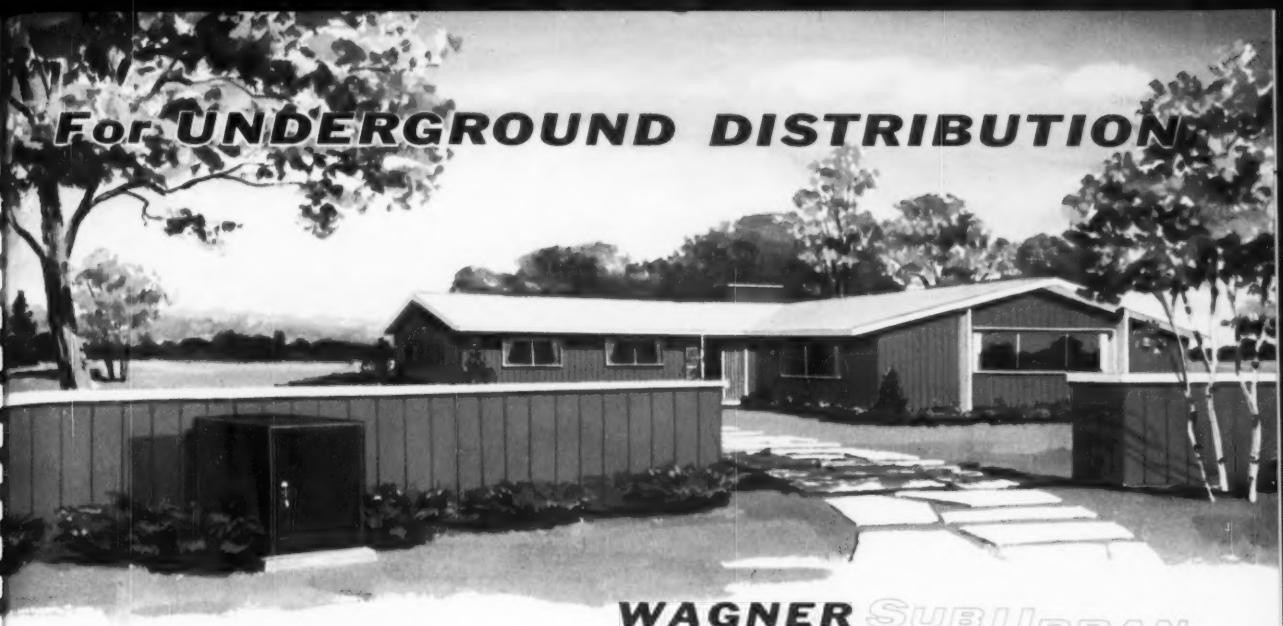
1. *Strength*
2. *Workability*
3. *Ruggedness*
4. *Long Life*
5. *Economy*

When you select a size and grade of strand for a specific job you want to know that it meets every requirement of that job. You want ample strength to sustain the ultimate load—plus an adequate safety factor. You want pliability for ease of working in the field. You want ruggedness to withstand the abuse which may be encountered during and after installation. You want long, dependable life. And, you want reasonably low first cost and low maintenance costs.

For more than 50 years *Crapo* Galvanized Steel Strand has consistently demonstrated its ability to more than meet all of these requirements. Proof of its reliable performance is to be found in the case histories of overhead power and communication lines throughout the country.

Crapo Galvanized Steel Strand is fully protected against corrosion by heavy, uniform, dense coatings of commercially pure zinc tightly bonded to the individual wires. All grades and sizes are available in A, B and C weights of coating.

For details, ask our distributor or write direct!
INDIANA
STEEL & WIRE
COMPANY, INC.
Muncie, Indiana



WAGNER SUB URBAN TRANSFORMERS

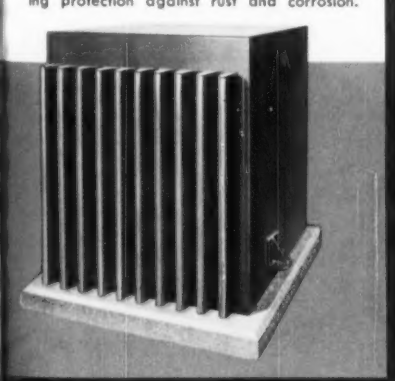
are safe . . . well-ventilated . . . adaptable to future load growth

Wagner Sub-Urban Pad Mounted Transformers are designed to be used wherever underground distribution is necessary or desirable. Their compact size and low profile make them ideal for use in residential areas—plantings of low shrubbery will hide them. They are safe to use—underground systems protect the public from exposed hot lines, and the tamper-proof enclosure can be padlocked. A protective door over the primary compartment permits working on the secondary without danger from high voltage. Well-ventilated, they can be loaded to capacity. When load growth makes it necessary, larger transformers can be quickly and easily installed to replace the original transformer units.

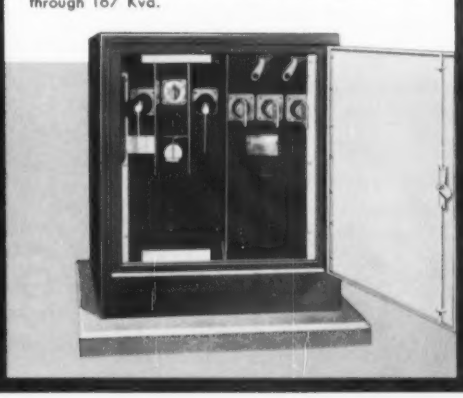
Get the whole story of Wagner Sub-Urban Transformers. Consult your nearby Wagner Sales Engineer, or write for Bulletin TU-148.

Wagner Electric Corporation
6400 PLYMOUTH AVENUE, ST. LOUIS 33, MO.

BUILT TO LAST—Tank is of heavy gauge sheet steel, with welded-on cover. Smoothly shaped radiators are welded to tank along their entire length. Complete special asphalt-type undercoating gives lasting protection against rust and corrosion.



SINGLE-PHASE—Here is the terminal cabinet of a 100 Kva single-phase transformer. Barrier plates are provided between the high voltage bushings and between the high and low voltage compartments. Single-phase units are available in ratings from 25 through 167 Kva.



THREE-PHASE—Terminal cabinet of a 225 Kva three-phase Sub-Urban Transformer. High voltage tap changer is at the left side of the nameplate. Three-phase pad units are available in ratings from 75 through 500 Kva.

WAGNER DISTRIBUTION TRANSFORMERS
. . . the choice of leaders in the electric utility industry!

For OVERHEAD Distribution...

WAGNER POLE-TYPE TRANSFORMERS

give longer life... greater efficiency

Wagner pole-type single-phase transformers are designed to meet all electrical requirements of modern overhead distribution systems: high efficiency, low exciting current, low impedance, high short circuit and overload capability. In addition, they offer mechanical features such as smaller size... safety-keyed bushings, and a long-lasting tank finish that give you easy installation, safe operation, long service life—extra value for your transformer dollar.

They are available in ratings from 5 to 250 Kva, 15 KV and below, from factory, branch, and distributor stocks. Consult your nearby Wagner Sales Engineer about your transformer requirements, or write us.

PLASTIC-COATED COVER

This porcelain-like coating gives improved corrosion resistance to tank covers, protects from line to ground, insulates small animals from the grounded cover to prevent outages. Applied to the covers, clamping ring and cover bolts, it is available without extra cost on all Transformers with cover mounted bushings.

LONG-LIFE TANK FINISH

A new formula anti-corrosive paint, carefully applied and thoroughly cured, provides a "Sure Seal" finish that withstands all temperature changes—is much longer lasting in corrosive atmospheres.

LOW LOSS CORE

Made of highest quality cold-rolled steel, wound to provide a low reluctance path for the magnetic lines of force. Keeps losses and exciting current low.

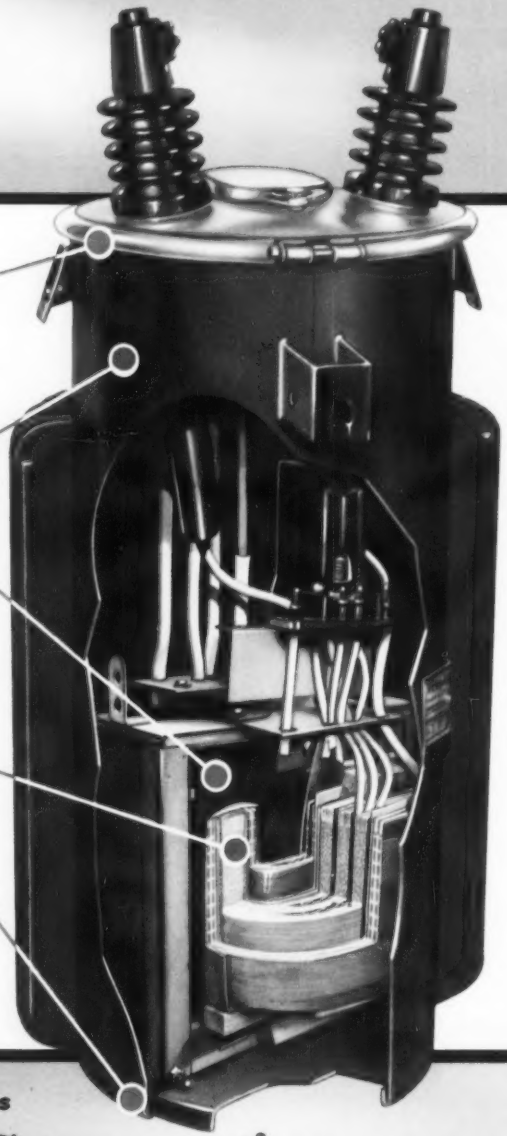
COIL, carefully wound of pure copper wire or strip, has new lower impedance to improve voltage regulation.

BONDED INSULATION

Layer, channel and barrier insulation is coated with a thermo-setting material that bonds the coil structure into a strong, electrically efficient unit with high short circuit capability.

ROLLED-UNDER BASES

This new base design provides extra strength... better moisture drainage. Serves as an additional safeguard against leakage of oil from the tank. It lessens the chance for finish damage due to scraping.

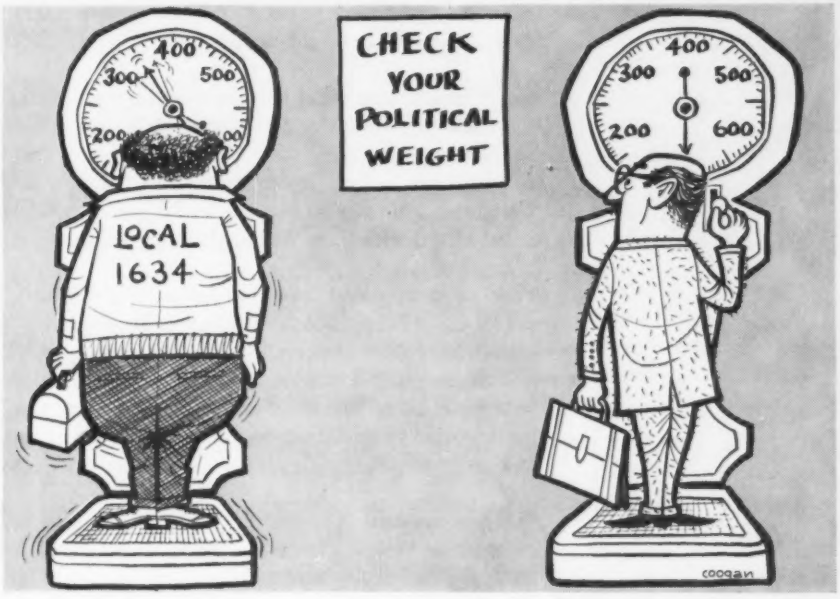


BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6400 PLYMOUTH AVENUE, ST. LOUIS 33, MO.

WT60-11



How Executives Rate in Politics

Report on **Businessmen in Politics**

Business leaders who expect to take a more active part in politics this year will find they have a relatively high degree of public acceptance. Considerably higher, in fact, than many had previously believed. Here is what the latest surveys of public opinion show:

- **The vast majority of people welcome** participation in politics by the nation's business executives.
- **Most executives, however, have done little,** if any, active work in politics.
- **Partly, this has been due to a fear** of public disapproval.
- **But the businessman has a considerable amount of public approval,** and a very favorable public image. His image is much more favorable, in fact, than that of union leaders, traditionally active in politics.
- **People, however, find the businessman's views much less believable** when they center on matters involving a conflict of interest, such as tax law or labor legislation.
- **And a good segment of the general public objects** to companies themselves mixing in politics. Businessmen should play down their company ties if they want to become influential spokesmen.

These are highlights of some findings presented by Walter G. Barlow, president of Opinion Research Corporation, at the 43rd annual convention of the Pacific Coast Electrical Association recently. Barlow's facts were drawn from the Public Opinion Index for Industry, a monthly opinion survey that is financed by 80 major US corporations and organizations (including Edison Electric Institute).

Barlow's survey results cannot be used to pass judgment on the propriety of the businessman in politics. But whether or not it is prudent for companies and executives to get into politics in a much bigger way, the figures give wholehearted encouragement to those who believe it is. This comes at a time when businessmen all over the nation are beginning to ask more questions than ever about their role in politics. Up to now, surveys show, their political activity has been limited in more cases than not. Still, businessmen have taken a more active role in politics than some people would believe.

For example, surveys of businessmen, both large and small across the nation, show the following record of political activity. **(1)** About 51% of all executives have never written the men who represent them in Washington. **(2)** Furthermore, 55% of businessmen have never suggested to anyone else that they get in touch with Congress. And **(3)** more than two-thirds of all businessmen (about 69%) have never talked with their Washington representatives about legislation.

Fear of disapproval has kept many businessmen from becoming more active politically. Public scorn invariably accompanies the political aspirant, many executives believe. Actually, this is hardly true. The public has a much more permissive attitude toward the businessman-politician than executives themselves have been led to believe. Surveys show the vast majority of people favor business participation in public affairs. And people would much rather see business leaders in high government office than they would labor leaders.

"Do you approve of appointing outstanding union leaders to government posts . . . outstanding business leaders?" To these questions, the general public, nationwide, answered heavily in favor of the businessman. Only 39% of the general public approves of giving government posts to union leaders. But a full 70% approves of putting business leaders in government office.

Republicans, of course, look most favorably on the businessman in government; nine out of ten of them approve of having business leaders in government posts. Independents also strongly favor business leaders for jobs in government (by a margin of 79%). But executives rate somewhat lower with the Democrats; only 68% of them say they approve of placing businessmen in high office.

People Will Accept Company Views—Up to a Point

Suppose business does take a more active role in public affairs; will it do any good? That depends largely on the issues involved. People say they want to hear big corporations give their views on national issues. But the chance that a company's position will be accepted falls off swiftly in areas that are purely political. Less than half the population believes that companies should give their views on tax legislation and purely political issues. But the majority of persons would like to hear company viewpoints on such matters as inflation, price controls, living standards, and the effects of automation.

In other words, where business can demonstrate its competence to speak, it can count on being believed.

The general public views the businessman in a highly favorable light. Among manufacturing employees, for example, he is seen as an energetic, forward-looking, intelligent individual. This image is much more favorable than that of labor leaders (see the table at top of opposite page).

And interestingly enough, manufacturing employees rate their own bosses much higher than the national averages shown in the table. The executives they know best are the ones they like and trust most.

How Manufacturing Employees Rate Business and Union Leaders

Positive Image	Business Leaders	Union Leaders
Intelligent	69%	42%
Forward-looking	56	39
Fair-minded	54	42
Capable	52	39
Hard-working	48	42
Energetic	45	36
Trustworthy	33	23
Considerate	33	33
Honest and truthful	32	21

Negative Image	Business Leaders	Union Leaders
Arrogant	7%	16%
Ruthless	8	17
Cold-hearted	12	14
Selfish	12	14
Over-ambitious	13	20
Power-hungry	15	32
Money-mad	20	13

Everyone, however, recognizes that the businessman in politics is somewhat self-seeking. But most people don't believe he is so self-seeking that he cannot consider, and give proper weight to, the goals and needs of others. For example:

• Will businessmen in government work for the good of the average man? To this question, 66% of the general public answers, "Yes." Only 23% of the general public believes the businessman will not work for the good of the average man. And 11% have no opinion.

• Will businessmen in government give labor a square deal? About 67% of the general public believes a businessman in government would. About 18%, however, feel a businessman would not give labor a square deal, and 15% have no opinion.

But again, just because the businessman is a respected and trusted public figure, he cannot automatically count on being believed every time he opens his mouth. Notice in the following tabulation of employee attitudes that the businessman's credibility is highest on matters that are directly related to the conduct of business. The executive's credibility falls off where he has a self-interest to protect.

I am "very sure" I can depend on the top executives in my company to do the following:

Make working conditions as safe as possible	82%
Run the company efficiently	79
Look out for the interests of the shareholders	79
Keep the promises they make to employees	67
Provide us with steady work and avoid layoffs	60
Deal fairly with the labor unions	47
Give good advice to government on taxes	33
Give good advice to government on labor laws	29

Do Unions Have an Inside Track?

A persistent view shared by many businessmen is that unions have the inside track with the working public; thus business can make little headway in politics. It is true that labor unions have been trying harder than ever to influence their members' votes. In the 1958 elections unions made their heaviest assault. In that year, 27% of all union members received union campaign literature. So did 13% of the non-union public. Furthermore, someone from the unions talked to at least 14% of all union members about voting (but only 4% of the non-union public was contacted personally by union members trying to influence votes).

These figures no doubt understate the proportion of people the unions actually reached, Barlow commented. But it is significant that there are apparently vast numbers of voters who are not being reached by the unions today.

Businessmen who decide to try and reach these voters, however, should do it on their own. Surveys show a good many people are willing to listen to company views on public issues. But a large segment of the public (61%) believes companies should not mix in politics directly. In other words, businessmen in politics should ignore their company connections. They will be far more influential spokesmen as private citizens. It is a mistake to try and capitalize politically on the power and prestige of an impressive job with a big corporation.

How Executives Can Be More Effective in Politics

The businessman has the opportunity to be heard. The public will consider his views. But an executive's effectiveness in politics will be limited unless a few simple guidelines are followed. Barlow gave these:

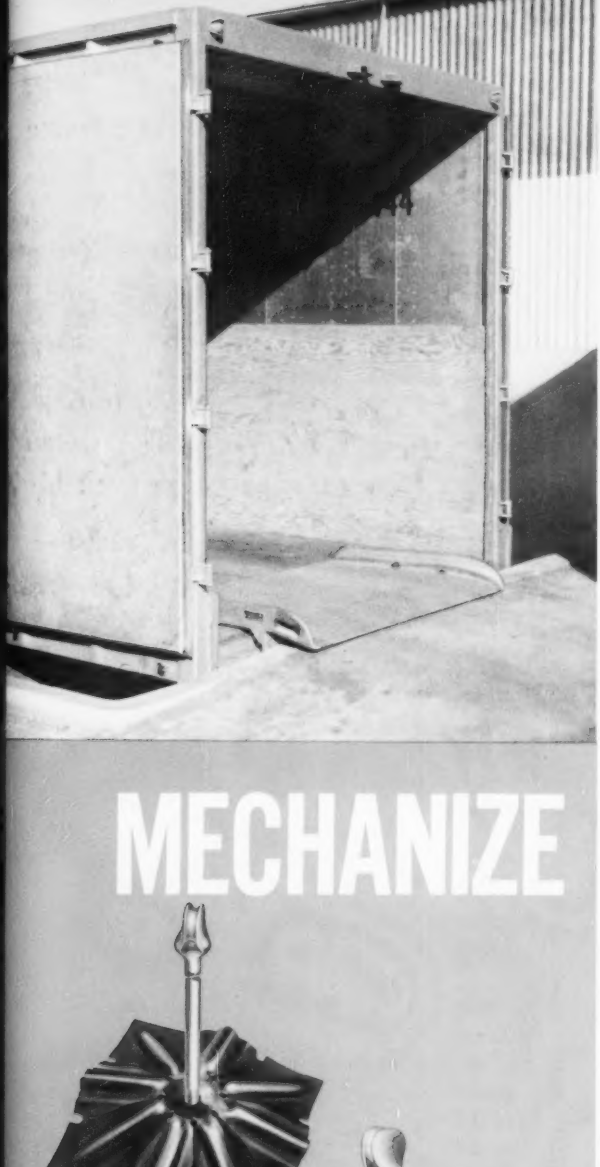
• **Businessmen need to make themselves appear a little more "human."** There is little popular appeal in the cold, stern, chief-executive-type image. Businessmen must reach beyond their clubs and business groups, and move down to the entire community in their personal contacts. Volumes of surveys have all shown that the better people get to know business leaders, the better they like them. All too often, however, they do not know them, and know no one who does.

• **Businessmen should show that they understand other peoples' goals** and ambitions. Many businessmen concentrate most of their waking hours on their jobs and companies. Hence, company problems are seldom very far from their thoughts. But executives must recognize that other people are concentrating on goals and ambitions they consider no less compelling: a new home, job security, an education for their children, or simply making ends meet.

• **Businessmen should not divorce themselves entirely** from self-interest. Self interests cannot be ignored and it does no good to deny them. People expect others to have a reasonable degree of self-interest. By proclaiming complete divorce from self-interest, the businessman is only asking for trouble. He simply will not be believed. He must strike a balance. He must maintain a believable stance between an overpowering self-interest on the one hand, that almost no one would accept, and a feigned disinterest on the other hand that many will interpret as false and deceptive.

• **Businessmen should encourage their employees** to take a more active part in politics. And they should do it in such a way that the principles of business get a fair hearing in politics. That doesn't mean businessmen should simply urge their workers to get out and vote. Getting more people to the polls, without sufficient understanding of the issues facing business, can work against business' political aims. Analysis shows that the people who stay away from the polls are precisely those that are least likely to vote on the side of business. Big turnout alone is not the answer. Some large companies have understood the implications of this fact, Barlow pointed out, and have started educational programs for their employees. Such programs are not designed to convert employees to one party or another. They are simply aimed at developing a greater personal awareness of the economic issues at stake in political campaigns.

• **Businessmen should seek advice from experienced politicians.** Getting results in politics is not as much like getting results in business as many would have us believe. A few, well-trained company employees may do business more good politically than vast numbers of amateur politicians.



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8-WAY ANCHOR

NEVER-CREEP ANCHOR

CROSS-PLATE ANCHOR

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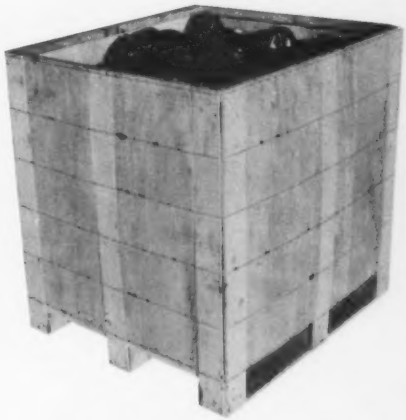
Check

with CHANCE palletized anchors

packaged and palletized at No Extra Cost . . .

simplify stocking and handling



● IN COLOR-CODED CARTONS

The color on the carton tells you what size anchor is in it . . . makes it easy to select the anchors you need at a glance, both in the warehouse and the field. There's no haphazard searching for a particular size; cartons store easily, anchors stay put until needed.

● ON EXPENDABLE PALLETS FOR INDOOR STORAGE

The color-coded cartons are held to the pallet—and to each other—by a special adhesive (there are no steel straps to cut), and can be removed from the pallet one-at-a-time. They break away from the stack easily; removing one doesn't disturb or loosen the others. Pallets can be stacked to reduce storage space needed. Minimize handling, too.

● IN PALLETIZED WIREBOUND CRATES FOR OUTDOOR STORAGE

Here's the best way to order your Chance Anchors in bulk. Anchors of the same size stay together in storage in neat stacks. Compact crates take up less storage space, cut handling costs, improve your stock department's "good housekeeping" practices.

● Cross-Plate Anchors are also available in bulk, strapped to expendable pallets without the crating.

Check with your Chance Representative . . . get the whole story of mechanized anchor handling.

your anchor handling

You probably have the mechanizing equipment . . . lift trucks and pallet trucks. So make the simple switch to faster, easier anchor handling. Next time you order Chance 8-Way, Never-Creep, or Cross-Plate Anchors, specify that they be shipped to you on pallets.

When you receive palletized anchors, unloading and handling time is cut way down. There's no time-consuming, laborious carton-by-carton loading and unloading. One man with a lift or pallet truck moves anchors from trailer or box car to storage in one continuous operation.

And pallets, of course, can be stacked . . . to take less floor space, releasing it for other uses. Anchor cartons can be removed as needed or whole pallet loads for big construction jobs can be moved in one simple operation.

Flip this flap for more details on how to get CHANCE packaged, palletized anchors from us to you, to the job this easy, economical way.

MECHANIZ

Here is a way to get
hole-boring equipmen
and get better anch
Screw Anchors.

Your present power
type, can be easily ad
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install anchors in 5 to
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Chance Power-Install
78 to 176 square inch
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NIZE SCREW ANCHOR INSTALLATION

get more out of your investment in
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equipment the special wrench shown
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5 to 8 *man* minutes. That's the time
plete installation... *from the time the*
ved into position until the anchor is
. The wrench transmits torque from
ent directly to the specially designed
r helix. Wrenches are made to fit all
earth borers. And, since the anchor
ed to torque, it only has to be heavy
t the guy load. That's a cost-saving

stalled Screw Anchors, ranging from
inches in area, go down fast into all
ept extremely rocky soil). Hundreds
d pull tests prove these anchors hold
eep than any anchors of comparable

For the ultimate in mechanized anchor installations, use this method and get:

- Lower installation costs per anchor
- Better utilization of expensive equipment
- Greater holding power with less creep
- Consistent results
- Elimination of human variables and error
- Less physical effort, better employee relations

Contact your Chance Representative. Now. He'd like to tell you more about mechanized anchor installations, show you test results, and help you apply this new technique to save time, cut costs, and improve your anchoring.

ABC INDUSTRIES

A. B. CHANCE COMPANY
Centralia, Missouri

(A. B. Chance Company of Canada, Ltd., Toronto)

CA60-2

RACING FANS are kept warm with 270 quartz lamps at the Maywood Park in Illinois. System provides up to 30 w of radiant energy per square foot

Infra-red Heat Off to the Races

The soft summer breeze shouldn't let utility men forget the problems of planning for winter heating. Commonwealth Edison Co has found the answer to some of its customers' wintertime dilemmas.

Infra-red heat's peculiar characteristic of heating objects and not space is being used by rapidly growing numbers of Commonwealth Ed customers.

Most recent, and perhaps the most spectacular, installation is at the Maywood Park race track. The track features early spring and late fall harness racing, and most of it at night.

This combination presented a problem of comfort for fans in the stands. The problem was solved by the installation of quartz lamp heaters which now warm the fans without involving excessive heat losses. This is because the job is done without heating the wide-open spaces of the stands.

The Maywood Park installation consists of 270 quartz lamps of 3,800 w each. The system provides up to 30 w of radiant energy per square foot. In addition to providing warmth for nearly 4,600 fans in the 21,000 sq ft grandstand, the lamps produce 70 to 80 foot-candles of illumination. Besides providing safety and a pleasant atmosphere, the high level of illumination facilitates study of racing forms and placing of bets.

Another recent infra-red heat installation on the Commonwealth Edison system was above show windows at Carson Pirie Scott & Co department store. (EW, March 14, 1960, p 109.)

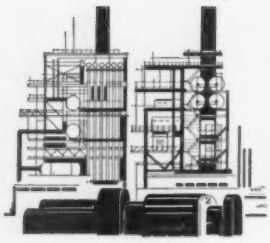
At the Consumers Co shops, heavy-duty equipment, such as trucks, bulldozers, and earth-moving and material handling equipment is brought in for repairs. This is a typical shop with large doors at each end and when the equipment is brought in it is cold.

The installation of 132 kw of quartz lamps in the shop now heats the men and equipment on which they are working. Heating the equipment is as important as heating the men, the company reported. Before the quartz lamps were installed it was necessary to bring in equipment several hours before the mechanics went to work on it. Now, it can be brought in just a few minutes before.

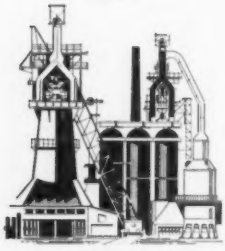
Commonwealth Edison itself has first-hand knowledge of the benefits of this type of installation. Quartz lamps were installed in its own shops

(*Continued on page* 113)

HOTEL GUESTS aren't bothered by cold weather if they stand under the quartz lamps in the hotel's marquee

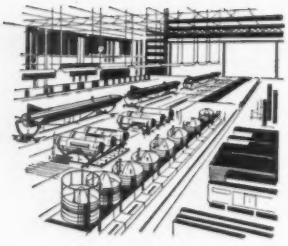


ELECTRIC POWER

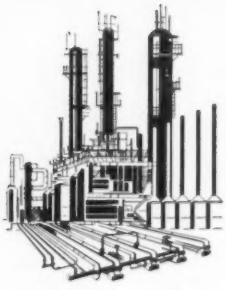


STEELMAKING

RW-300



MISSILE AND AIRCRAFT



OIL REFINING AND CHEMICAL

MANY "LEADERS" IN DIGITAL COMPUTERS, BUT ONLY ONE LEADER IN DIGITAL CONTROL COMPUTERS

THE THOMPSON-RAMO-WOOLDRIDGE PRODUCTS COMPANY

a division of ***Thompson Ramo Wooldridge Inc.***

202 NORTH CANON DRIVE · BEVERLY HILLS, CALIFORNIA · BRADSHAW 2-8892

80% OF ALL DIGITAL CONTROL COMPUTERS NOW OPERATING IN INDUSTRY ARE RW-300 SYSTEMS

There are many companies which make various kinds of digital computers. These electronic machines serve useful purposes, ranging from the handling of payrolls to the solving of abstract mathematical problems, but they are not intended to *control* industrial processes. They are not designed to be connected directly to processes or test loops.

The Thompson-Ramo-Wooldridge RW-300 Digital Control Computer is built specifically for that purpose—to operate continuously a diversity of production processes in such industries as electric power, primary metals, missile and aircraft, electronics, chemicals, petroleum refining, pipelines, cement, and nuclear.

The RW-300 leads the field with 18 installations which have logged a total of 145,000 hours of operation—more than 16 years. It provides reliability exceeding 99% in around-the-clock applications. That is why you will see RW-300 systems in 80% of all industrial installations employing digital control computers.

For further information on the RW-300 and the associated engineering services, call or write Mr. Raymond E. Jacobson, Director of Marketing, Dept. EWO-1218-1.

RW-300 computer controlling ammonia production at Monsanto Chemical Company plant, Luling, Louisiana.

TRW

Infra-red Heat (*Continued from page* 111)

two years ago where such heavy-duty equipment is repaired. The results were so impressive that their sales people are telling the story to their customers.

The baggage room at Continental Air Lines has proved another ideal place for quartz tube heating. There it is desireable to heat people in the baggage room but there is no need for heating the space. Installation of 56 kw of quartz tubes has provided an economical and highly satisfactory solution.

At the Matissa Rail Welding Co plant there is a continuous rail welding station 100 ft long. Heating is required at only four points, where the welds have to be made at the end of the rails. Mobile 45-w quartz lamps were installed at these points so that their position can be adjusted to changes in welding points.

Travelers on Chicago's elevated lines are now in line for the benefits of the unique heating characteristics of quartz tubes. Five units have been installed on a trial basis on the platform of an elevated station. They are located under the canopy in front of a billboard that acts as a windbreaker.

These units are thermostatically controlled to turn on only when the temperature drops below 32F.

Arriving and departing guests at the Edgewater Beach Hotel during cold weather are in for a treat which won't appear on their hotel bill.

The heating system uses two rows of fixtures under its 20x20-ft marquee. One row has 12 1,600-w lamps; the other uses 12 1,000-w lamps. Together the lamps provide 40 to 75 w of radiant heat per square foot at the pedestrian level. Lighting levels range from 160 to 300 ft-c. Electric capacity which the the hotel has used in the past for its summer air conditioning is employed to operate the lamps.

The quartz lamps provide another load building tool that fits well into today's load curve, and render invaluable services to customers, Commonwealth Edison said.

Appliances Need Specialty Selling

Specialty selling with emphasis on quality and service is what it will take to stem the tide and regain the appliance industry's share of the consumer dollar, Robert H. Quayle Jr, president, Norge Division, Borg Warner Corp, said at the mid-year appliance show in Chicago.

Quayle said the appliance business has lost its share of the customer dollar at a time when the economy of the country is strong. Yet, "sales and profits of the appliance business are in the doldrums." Refrigerator shipments are down 5% and automatic washer sales are down 7%.

Such a situation, said Quayle, calls for a great deal of soul searching. He suggested that possible reasons for the conditions may be:

1. Lack of revolutionary product development.

2. No solutions for new customer demands, such as longer-lasting appliances.

3. Excessively high service costs.

4. Consumer confusion due to lack of benefit selling.

The appliance business is now reaching the consumer through fewer people. Profit margins are being squeezed tighter and tighter. The retail effort becomes more and more concentrated on lower prices and less and less a question of how best to serve the consumer.

"It is obvious," said Quayle, "that the share of the consumer dollar for appliance manufacturers will continue to shrink as long as we are forced to wait for our customers to come in and look at a long row of white appliances . . . examine the price tags and select the cheapest. The way out of this is going to be bloody because only the strongest will survive. With this ruthless competition, the business will fall inevitably into fewer and fewer hands and then as prices become lower and lower and there is no place left to go, somebody is going to rediscover that there is a place for good selling—there is a place for good service—there is a place for reliability and integrity. Then, and only then, can the appliance business hope to increase its share of the consumer dollar."

Frisbee Elected VP of Pacific P&L

Don C. Frisbee has been elected vice president and treasurer of Pacific Power & Light Co.

Treasurer since 1958, he succeeds George F. Mackenzie who retires after 47 years with the utility. Mackenzie will continue to serve as a member of the board of directors and in a consulting capacity.

Frisbee joined Pacific Power & Light in 1953. He was appointed an assistant treasurer in 1956, and was named an assistant secretary in 1958. In his present assignment he will be responsible for the functions of the company's treasury and secretarial departments.

Before becoming associated with Pacific P&L he was a senior investment analyst and assistant cashier for the First National Bank of Oregon.

RCA Makes Graham a Vice President

J. J. Graham has been named division vice president and general manager, Communications and Industrial Electronic Products Operations Division, at Radio Corp of America.

Previous posts include manager, manufacturing engineering administration, controller of the commercial electronic products unit, and manager of operations administration. In December, 1958, he was then appointed to general manager of the division of which he is now vice president.

Stonecipher Named President of Arvin Industries

Arvin Industries, Inc, has named Eldo H. Stonecipher (photo) president and general manager. He is the third president in Arvin's 41-year history and succeeds Glenn W. Thompson who had been president and chairman of the board since 1954. Thompson will continue as board chairman.

Stonecipher has been with Arvin for 28 years. He has been a director since 1947, and vice president and general manager of Arvin's Automotive Division since 1955. He has also been a plant superintendent and plant manager.

Thompson joined Arvin in 1924, and was sales manager and vice president before being named president.

McKinnon Joins SEE As Assistant Director

Robert W. McKinnon has joined the Southeastern Electric Exchange as assistant director.

McKinnon has been engaged in similar work since 1952 as executive secretary of the Public Utilities Assn of the Virginias.

Before that he was with the West Virginia Industrial and Publicity Commission, as assistant director, and then executive director.

PERSONAL BRIEFS

Otto Naef, staff engineer-switchgear in the Electrical Engineering Division of the American Electric Power Service Corp, has retired.

Maurice P. Stoelting has been promoted to labor relations manager, and **Roland W. Eggert** to payroll supervisor, at Public Service Co of Indiana, Inc.

E. Stanley Peterson has become supervisor of distribution at Gardner, Mass., for Worcester County Electric Co, replacing **Kenneth W. Lovejoy,** retired.

Philip C. Pray of New England Electric System has retired, as has **Herbert E. Gfroerer,** district engineer.

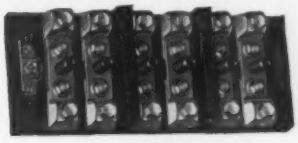
Public Service Co of Colorado has promoted **Garrett W. Craig** to assistant manager of division operations; **Jack H. Reed,** division manager at Sterling, and **Wilbur M. Weir,** assistant director of information.

Perry Keller has retired from Potomac Light & Power Co.

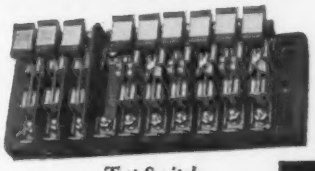
(*More News About People, page* 116)

Look to Superior for

TEST SWITCHES AND BLOCKS



Test Block



Test Switch

Superior also offers a complete line of
Enclosures
Socket Equipment

SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of The Union Metal Manufacturing Company

Catalog 55 offers complete information on features, services, type and sizes. Write to:

2 ways to get to the TOP

1. **Send in the coupon below.**
2. **Receive your own copies of Electrical World at home each week.**

It'll put you on top of the "Routing Slip," on top of industry developments and who knows, maybe someday on top of the heap. The cost: $6 for 52 issues. No need to send money now.

Send 52 issues of Electrical World to:

Name_____
Address_____ House ☐ Business ☐
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330 West 42nd Street, New York 36, N.Y.
HA-2

BIDDLE INSTRUMENTS

DIELECTRIC TEST EQUIPMENT

40 KV Model is a one-man portable set for maintenance d-c tests. Maximum safety built in. Simple operation. Reliable performance. You get excellent output voltage with facilities for voltage and leakage current measurements.

Also available: model for operation up to 100 KV and another for operation to 5 KV. Useful for development work to test d-c dielectric strength of insulating materials and adequacy of design of insulation in equipment; also in production tests for non-destructively detecting defects in electrical insulation.

Write for BULLETIN 22-W.

BIDDLE

JAMES G. BIDDLE CO.
Electrical and Speed Measuring Equipment
1316 Arch Street, Philadelphia 7, Pa.

(*Continued from page* 115)

Sidney G. Baucom, has been named assistant secretary of Utah Power & Light Co, succeeding **Charles L. Ovard** who died recently.

Red Ritson has been promoted to director of advertising at Atlantic City Electric Co.

Virginia Electric & Power Co has promoted **S. Harold Fletcher** to assistant personnel manager; **Floyd L. Biggs** to Richmond District manager; **James S. Hamilton** to Fredericksburg district manager; and **Charles L. Sale** to Albemarle district manager. **L. D. Johnson III** has been appointed assistant Richmond district manager, **L. L. Eley,** chief design engineer; **J. V. Barker,** assistant superintendent of construction; **A. S. Hadfield,** system superintendent of distribution; **B. L. Gamble,** manager at Portsmouth; **W. A. Teele,** manager at Fishersville; **R. N. Fricke,** Norfolk manager; and **W. Perry Johnson,** manager of sales contracts.

Delbert W. Shobe has been named sales manager for the Waukesha plant of the RT&E Corp.

William L. Sheets, vice president of Stone & Webster Engineering Corp, has been named senior construction manager.

G. P. Bakken, president of Chase Brass & Copper Co, has been elected president of the Copper & Brass Research Assn.

A. G. Christie, emeritus professor of mechanical engineering, Johns Hopkins University, was presented a citation by the Regents of the University of Wisconsin, for his contributions in the field of education and in the engineering profession.

James P. Moore Jr has been assigned to Allis-Chalmers Mfg Co's nuclear power department, and **Alexander J. Jasinski** has joined the control department as an application engineer. Three appointments to the Power Equipment Division are: **Norman C. Grimshaw,** transformer development, Terre Haute Works; **Robert C. Peterson,** application engineer, heat transfer department; and **Richard R. Schroeder,** steam turbine department.

Merle Call has been made sales manager of Holan Corp of Georgia.

Acoustica Associates, Inc, has opened a new eastern Marketing and Engineering Division at 600 Old Country Rd, Garden City, L. I., N. Y. New personnel there are: **William Katsara,** eastern regional gaging equipment sales manager; **Maurice Howell,** eastern regional cleaning system sales manager; **Arthur Liers,** eastern service manager; and **Samuel Markel,** in charge of electronic subcontracting activities.

Vice President **Lawrence L. Garber,** Electric Autolite Co, moves to the president's staff to work in the areas of manufacturing, properties and capital equipment.

P. R. Mallory & Co, Inc, has named **Paul L. Hotte** manager of the Mallory Metallurgical Co.

Westinghouse Electric Corp has made the following promotions in its Pittsburgh, Pa., headquarters: **L. J. Owsley,** regional marketing manager; **N. C. Warner,** regional agency and construction, aviation and transportation products manager; and **M. J. McDonough,** regional electric utility and industrial products manager.

Raytheon Corp has made the following appointments: **William H. Weed,** advertising and sales promotion manager, Industrial Components Division; **Dr Glen Wade,** associate director of engineering-general research, Microwave & Power Tube Division; **Alfred S. Buyer,** advertising and sales promotion manager, microwave cooking department; **Ralph E. Leader,** manager of the microwave cooking department; **William R. Cox,** publicity specialist for the Commercial Division, public relations department; and **Frederick H. Brooke Jr,** marketing manager for Raytheon A.B.

Robert A. Harris has been named regional engineer for the Bureau of Reclamation at Boise, Idaho.

I-T-E Circuit Breaker Co has promoted **Maxwell L. Stoughton** to apparatus engineer for the Kelman Power Circuit Breaker Division. He will work out of Los Angeles.

PROFESSIONAL SERVICES

BLACK & VEATCH
Consulting Engineers
Electricity—Water—Sewage—Industry
Reports, Design, Supervision of Construction
Investigations, Valuations and Rates
1500 Meadow Lake Parkway
Kansas City 14, Missouri

THEODORE D. BROSS LINE CONSTRUCTION CORP.
Steel Tower & Wood Transmission Lines
Distribution & Maintenance
175 Enfield St. Hartford, Conn.

COMMONWEALTH SERVICES INC.
Management and Business Consultants
300 Park Ave.
New York 22, N. Y.

ASSOCIATES INC.
Consulting and Design Engineers
209 E. Washington
Jackson, Michigan

JENSEN, BOWEN & FARRELL
Engineers
Appraisals—Depreciation Studies—Property Records
Cost Trends—Special Studies—Reports for Rate Cases, Security Issues, Regulatory and Accounting Requirements
Michigan Theatre Building Ann Arbor, Michigan
NOrmandy 8-7778

PIONEER SERVICE & ENGINEERING CO.
Consulting and Design Engineers . . Purchasing Specialists in Financing Accounting and other Operations
231 So. La Salle St. Chicago 4

SANBORN MAP COMPANY, INC.
Nation Wide Mapping Services
• Utility Area Base Maps
• Symbolized System Portrayal
Atlanta - New York - Chicago - San Francisco

SARGENT & LUNDY
Engineers
Consultants to the Power Industry
STUDIES • DESIGN • SUPERVISION
140 South Dearborn Street, Chicago 3, Ill.

TIPPETT & GEE
Consulting Engineers
Mechanical • Electrical • Thermodynamic
Structural Design • Studies • Supervision
Power Stations • Transmission • Distribution
Industrial Plants • Process
1333 North Second Street Abilene, Texas

WHEN TIME IS SHORT . . . .
put the solution of your problems up to a specialized Consultant. His broad experience may save you months of costly experimentation.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

DISPLAYED RATE: ——RATES—— **UNDISPLAYED RATE:**

EMPLOYMENT OPPORTUNITIES: $25.50 per inch. Subject to Agency Commission.
EQUIPMENT & BUSINESS OPPORTUNITIES: $16.85 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.
EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.80 a line an insertion.
BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

Send New Advertisements to Classified Advertising Div. of Electrical World, P. O. Box 12, N. Y. 36, N. Y.

TRANSFORMERS

1—6667 kva Westinghouse, 3/60/115,000Y/13750
1—6000 kva G.E. 3/66000/2400/4160Y
1—2000 kva Nia. Askrael, 3/13800/14160Y/2400
3—1000 kva Westinghouse, 1/22900/480
3—1000 kva Westinghouse, 1/13800/480
3—1000 kva Westinghouse, 1/13800/2400/4160Y
3—1000 kva Standard, 1/44000/6900
3—1000 kva Standard, 1/69000/4160Y/2400
3—1000 kva Standard, 1/34400/480
3— 833 kva Allis Chalmers 1/60/12,000—480
3— 200 kva Westinghouse, 4800—240x480
3— 100 kva G.E., 2400/4160Y—120x240
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Difficulties Seen Ahead For Utah Utilities

Even if the Utah State Supreme Court retains its decision favoring utilities in the facilities relocation cost controversy, the utilities will probably encounter roadblocks being set up by the Highway Department.

Closely following a court ruling last month that the state must pay for utility facilities relocation caused by highway construction, Utah Highway Department Director C. Taylor Burton announced that plans were being studied which would keep utilities on the defensive.

He said the department was considering: (1) Requiring utilities to agree beforehand on the amount of relocation cost, and (2) Making them pay rent for right-of-way along public highways. If these proposals are rejected, the department might prevent public utilities from using the public right-of-way.

The court's decision reaffirmed as constitutional a 1957 act which had been ruled unconstitutional in 1958 by the state attorney general.

Supreme Court Justice F. Henri Henroid said in a concurring brief that, since the burden of cost was being shifted, the people should benefit in rate cuts.

State Attorney General Walter L. Budge echoed the judge's statement by declaring that the Utah Public Service Commission should re-examine rate structure of various public utilities and order reductions.

Highway Department Director Burton estimated the court's action would "cost the state millions of dollars in the future."

Goldwater Seeks Inquiry Into Use of Public Lands

Sen Barry Goldwater (R-Ariz.) is pushing for a federal-state study of farmers who are trespassing on Bureau of Reclamation lands along the Colorado River between Hoover Dam and Mexico. He and Rep Stewart Udall (D-Ariz.) have introduced identical bills in Congress.

Goldwater, who doesn't expect to get any committee consideration this year, will re-introduce the measure in 1961. His bill (S-3562) calls for a 15-man "resource planning commission for the Lower Colorado Basin to study multi-purpose use of public lands and other land areas near the Colorado River . . ." Most of the lands are between Parker Dam and Mexico.

The study commission, to last three years, would have representatives from Arizona, California, farmers, wildlife conservationists, and Congress. If successful, it would preclude further prosecution by the Justice Department—at Interior Department's request—now pending against seven farmers.

The Shape of Things

Indianapolis police are looking for a hit-and-run motorist whose vehicle's shape will match the abstract pattern formed by this utility pole. When the electric power in a suburban part of the city failed, an investigation showed this to be the cause. The motorist who tangled with the pole had departed for parts unknown.

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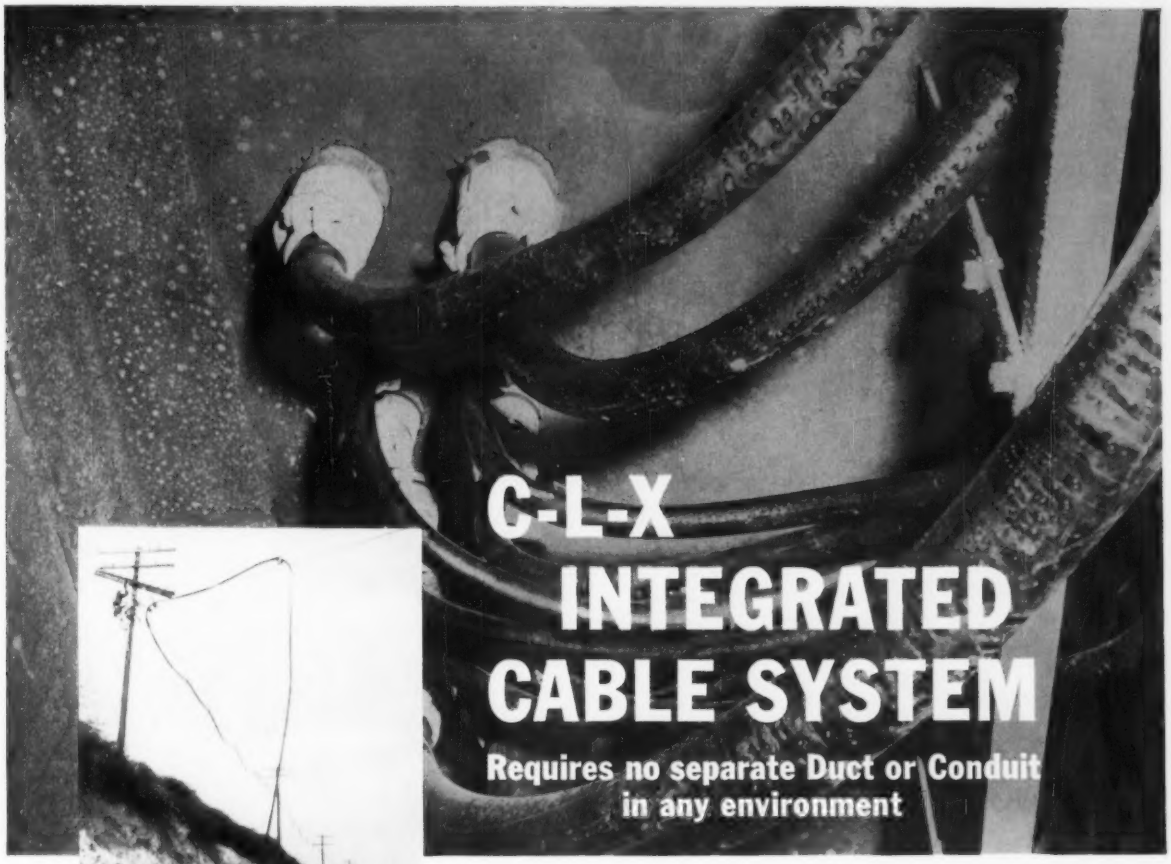

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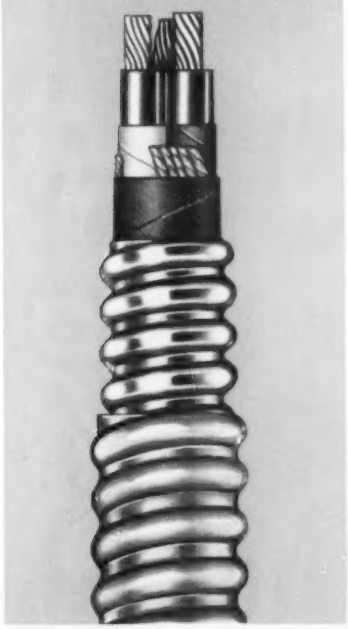

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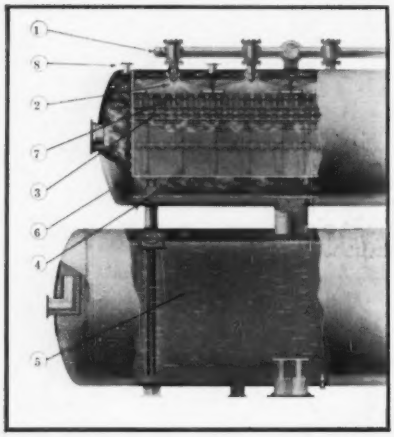

The true counter current principle used in Worthington tray deaerators: (1) water enters; (2) water is atomized into primary heating chamber; (3) water flows over staggered rows of heating and deaerating trays; (4) water finally falls freely through pure steam to (5) storage; (6) steam enters at bottom only; (7) steam sweeps all non-condensable gases upward; (8) mixture vents through suitable baffles.

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